

ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PRESIDENCY, 1929-30

CHAPTER I

FEATURES OF THE YEAR

Monsoon.—The special feature of the 1929-30 monsoon was the long break in the middle, following good rainfall at the beginning. In Gujarat after mid-July there was very little rain till the end of September. Thus the rice crop was more or less poor in middle Gujarat, while the good rains early in October ensured the cotton crop. In Khandesh this long break had a very bad effect upon the kharif crops, with groundnut suffering most. In this tract the late September rains were poor, and hence the rabi crop was more or less a failure. In the Deccan the rabi crop was poor owing to the unsatisfactory distribution of the rains. In the Karnatak the long break adversely reacted on the kharif crop but the rabi crop was normal. In the Konkan the kharif season was good in the north, but not satisfactory in Ratnagiri and Kanara districts in the south. Sind had an unparalleled rainfall; thus East Sind received as much as 50 inches, while the rest of the province received amounts varying from 10 to 30 inches. This rainfall was for the most part received between the 13th July and 27th August.

Floods.—In Sind the River caused unprecedented floods. In the early part of the inundation season the water level was much below normal; in early September, however, the River rose to the abnormal height of 17'-3" at Bukkur. The bursting of the Shyok Dam coming immediately after heavy rain in the north of India and Sind itself, caused the Indus to overflow both banks in many places and to bring about widespread and unprecedented flooding, especially in Sukkur, Hyderabad and Nawabshah Districts, and this necessitated the temporary evacuation of the Agricultural Research Station at Sakrand which became surrounded by water on all sides but fortunately escaped being inundated. It was also fortunate that the rice crop in Larkana and Karachi Districts was mostly saved. These floods caused considerable loss of livestock and property but they served one useful purpose in stocking the soil with moisture; and the rabi crop was both extensive and successful.

Pests.—The year was notable for pests. Conspicuous among these was the locust in Sind which was widespread throughout the Province, sweeping over the country in large swarms, so that some places were visited on 25 occasions. A large swarm of locusts penetrated as far south as Khandesh, passing through four talukas of East Khandesh, one of West Khandesh and three of Nasik Districts, damaging jowar, wheat, linseed, tur and cotton. The establishment of the permanent Locust Committee within the organisation of the Imperial Council of Agricultural Research represents the first step in a rational policy of locust control by the Government of India; and now the collection of information throughout the North-West of India has been systematized and suitable combative measures widely adopted.

In the Kanara District of the Presidency the rice crop was severely damaged, to the estimated extent of 15 to 25 per cent. by the "Kanne" insect pest (*Pachytiplosis Oryzae*).

There was an unprecedentedly severe attack of aphid upon the Varyali (*Foeniculum vulgare*) crop in Kaira District, which resulted in the whole crop of 8,000 acres being totally destroyed. All the available agricultural staff was concentrated for the purpose of demonstrating combative measures such as spraying with "fish oil rosin soap", but owing to the advanced stage of the attack the crop could not be saved. The wingless grasshopper was not so troublesome in the Deccan as it has been in the recent past. Cotton-wilt continues to cause havoc in certain tracts, but in the Dharwar area the Department has been successful in evolving a wilt-resistant strain of cotton.

Prices.—The world slump in prices has been particularly in evidence in India. Sir George Schuster, the Finance Member of the Government of India, in a recent review of the situation is reported to have made the following significant observations in comparing the prices in November 1929 with those prevailing at the end of July 1930 :—

"Jute first in Calcutta had fallen by 30 per cent., wheat had fallen by 38 per cent., cotton by 40 per cent., rice and groundnuts by 14 and 20 per cent. respectively. These falls were obviously very serious. Appeals had been made by certain classes of agriculturists for help but if help was given to one class, there would be demands from other classes and there would be no end. No financial assistance could be given to any one class without putting additional burdens on the other classes or weakening Government's resources for other objects, which might be equally or more deserving. Government could consider action to alleviate the position in two ways, firstly, by giving

direct relief to the poorest classes and, secondly, by intervention in the marketing of produce. The general burden of land revenue in the country had not been adjusted to the higher prices that have prevailed since the war and that land revenue as it stood today was not out of adjustment with the lower levels to which prices had now fallen. The Banking Inquiry, now about to conclude, might indicate some lines but they ought also to face the question of establishing an organisation which would devote itself to the continuous study of economic problems, and organisation in which both the Provincial and Central Governments would be represented."

As the Bombay Presidency is the most important cotton Province in India it is important to indicate the magnitude of the fall of prices. Below are given the fortnightly prices in rupees per khandy for the Broach and Oomra Contracts for the past two years :—

				Cotton	
Months				Broach (fully good)	Oomra Fine (fair staple)
				Rs.	Rs.
1928	1st September	..	..	344	311
	15th September	..	..	316	282
	1st October	..	..	352	320
	15th October	..	..	353	322
	1st November	..	..	352	315
	15th November	..	..	356	319½
	1st December	..	..	363	328
	15th December	..	..	364½	329
1929	1st January	..	..	362½	326½
	15th January	..	..	362½	325
	1st February	..	..	353	319
	15th February	..	..	359	321
	1st March	..	..	361½	322½
	15th March	..	..	373½	328½
	1st April	..	..	356	317
	15th April	..	..	356½	321
	1st May	..	..	347	283
	15th May	..	..	347	284½
	1st June	..	..	325½	284½
	15th June	..	..	342½	288½
	1st July	..	..	336½	274½
	15th July	..	..	329½	272
	1st August	..	..	350½	314½
	15th August	..	..	337½	302½
	1st September	..	..	349	313½
	15th September	..	..	340	304
	1st October	..	..	341½	302½
	15th October	..	..	335½	292½
	1st November	..	..	330½	291
	15th November	..	..	317	277
	1st December	..	..	320	278
	15th December	..	..	317½	278

Months				Cotton	
				Broach (fully good)	Oomra Fine (fair staple)
				Rs.	Rs.
1930	1st January	..	..	308½	264½
	15th January	..	..	303½	260½
	1st February	..	..	285½	242½
	15th February	..	..	274½	235½
	1st March	..	..	253	216
	15th March	..	..	256½	220½
	1st April	..	..	270	236½
	15th April	..	..	255½	219
	1st May	..	..	253	210½
	15th May	..	..	251	209
	1st June	..	..	249	206
	15th June	..	..	240	197
	1st July	..	..	200	184
	15th July	..	..	187½	179½
	1st August	..	..	194	184
	15th August	..	..	186½	182
	1st September	..	..	210	180½
	15th September	..	..	205	176

Tendencies.—It has been stated in previous reports that there are marked signs of a considerable awakening among the agricultural classes of this Presidency. Now-a-days when an Agricultural Officer visits a locality, in which there has not been much agricultural propaganda, he finds it much easier to elicit a response from the people than his predecessor did some 15 or 20 years ago. In the Deccan Canal tracts the Irrigators are representing their interests much more effectively than they did a few years ago. They are becoming conscious of the fact that, as owners of the land and buyers of the water, they are entitled to be consulted by Government when canal rules and regulations are under consideration.

Evidence continues to accumulate of the greater readiness on the part of Traders in agricultural requisites to adapt their methods to the needs of agriculturists. Thus several firms, interested in tractors, have decided to collaborate with the Department of Agriculture in organizing a class for training tractor drivers, by providing tractors and skilled operators for a period of two months. An important Bombay firm has decided to follow up the pioneer work of the Department of Agriculture on mechanical cultivation in the Dharwar District by undertaking contract ploughing with motor tractors in that district to demonstrate the great possibilities of this method of cleaning the land.

Political unrest.—It is a matter for satisfaction to be able to record that the great upheaval in the political sphere, which has marked the past six months, has had no serious repercussive effects upon the work of the Department of Agriculture. All the operations of the Department have been proceeding normally; and, in particular, the propaganda activities which depend so greatly upon the response of the people, have received no check. Even in the worst affected parts of Gujarat the Department has continued to receive the active co-operation of the agricultural public, which indicates that the officers command the confidence of the people.

Tariffs.—Attention has been drawn to the fact that hitherto all protective tariffs in India have been put on in the interests of industry. It is therefore a matter of great agricultural significance that the Government of India are now considering the advisability of protecting an agricultural product, namely, sugar. As is widely known India consumes about a million tons of sugar annually but only produces one-tenth of that quantity, the remaining nine-tenths being imported.

Economic condition of the rural population.—Some observers have expressed the view that the improvement in the economic condition of the rural population, in India, in the last two decades, has been insignificant; and it has been suggested that insufficient co-ordination of the several nation-building departments is an important cause. As a matter of fact there is substantial co-ordination between the Agricultural, Co-operative and Revenue Departments; and the redistribution of ministerial portfolios referred to below is likely to make co-ordination of Government effort still more effective. Where rural economic progress has fallen short of expectation it is necessary to look for more fundamental causes than the co-ordination of Government Departments, without depreciating the importance of the latter condition. The last two decades embrace a cycle of high prices for agricultural commodities extending over a period of 15 years. During the same period there has been remarkable progress in agricultural improvements, through the efforts of official and non-official agencies. There is no doubt that the net increased earnings of the agriculturist, especially in the cotton and groundnut tracts, have greatly increased during the last decade and a half, but unfortunately much of this wealth has not gone back into agriculture, in the form of land-improvements such as embanking, well-making and fencing or in better-fed cattle. There are of course honourable exceptions: for example, the people of

Bardoli tract have spent considerable sums of money on better houses, a very wise investment; while in Bijapur district money has gone into land development. Nevertheless there are too many agriculturists who have spent their increased incomes on unproductive objects such as

Litigation,
Expensive tastes, and
Amenities.

Litigation has become an obsession and is a social evil of first order. It does not require a very lively imagination to visualize what the 19,000 civil suits, in 1929, must have cost East Khandesh in hard cash, in neglected farms and in distracted minds.

Expensive tastes are not quite synonymous with a higher standard of living. Rice has largely replaced bajri; it costs more but is a less nourishing food. A recent investigation in nine villages situated at distances ranging from 9 to 35 miles from Poona, with an aggregate population of 11,625 persons, revealed the fact that more sugar than gul was being consumed. In a very rural village in the Dharwar district 50 per cent. of the agriculturists are tea drinkers. These same people are depriving themselves of milk-products which they turn into cash for expenditure on these purposes. The net result would seem to be that the people are less well-fed at greater cost. In Nasik district the dress of the village people, in the course of a generation, has materially improved both in quality and quantity. The average cultivator, 30 years ago, did not possess a coat; now it is exceptional to find a man without one. This may sound a humble wardrobe, but I am comparing yesterday with today.

As regards amenities the ryot has become a motorist, through patronising on a big scale the public buses which incidentally enable him to attend the cinemas in the country-towns.

No one will grudge the ryot the infusion of a little relaxation into his rather drab life, but he seems in many cases to be losing the virtue of thrift and to be living above his income. The Professor of Agricultural Economics has been conducting investigations into the economics of a farm unit, and the case which he describes in detail on the third page of Appendix S of this report gives food for thought. Here we have an able-bodied peasant, owning a holding of less than 50 acres of land in Shahada taluka, who does no work either on his farm or in

any other capacity. Let us hope that he is not typical of this locality but the Professor has selected him as representative. If this diagnosis is substantially correct then the remedy seems to lie with the social reformer and educationist. The need for a more enlightened form of rural education is now generally recognized, but the necessary stimulus seems to be lacking. In this connection it is worthy of note that, henceforward, most of the nation-building departments are to be co-ordinated under the Minister of Agriculture. These include the Agricultural, the Co-operative, the Veterinary, the Forests and the Road (Public Works Department) Departments. Rural Education is the only important rural subject with the exception of Irrigation which is still a reserved subject, which is not included within this group of sister departments, controlled by one Minister.

Organization.—Mention was made in last year's report of the establishment of the Imperial Council of Agricultural Research by the Government of India. That will probably be regarded, in years to come, as an epoch marking event in the history of agricultural improvement in India. In the year under report there have been certain consequential developments. The Government of this Presidency has established a Provincial Council of Agricultural Research to advise it on research schemes to be submitted to the Imperial Council. The first personnel of this Council is as follows, *vide* Government Resolution No. 3461/28 dated 6th June 1930, Revenue Department :—

1. The Hon'ble Mr. B. V. Jadhav, Minister of Agriculture.
2. Mr. T. F. Main, Director of Agriculture (Secretary).
3. Rao Bahadur P. C. Patil, Ag. Principal, Agricultural College, Poona.
4. Mr. V. S. Bhide, Registrar, Co-operative Societies, B. P., Poona.
5. Mr. K. Hewlett, Principal, Bombay Veterinary College.
6. Dr. A. N. Meldrum, Principal, Royal Institute of Science.
7. Sir Joseph Kay, Kt.
8. Mr. Walchand Hirachand.
9. Rao Bahadur R. S. Asavale, M.L.C.
10. Rao Bahadur Bhimbhai R. Naik.
11. Mr. R. G. Pradhan, M.L.C.
12. Mr. S. A. Sardesai, M.L.C.
13. Sardar Bhasaheb *alias* Dulabava Raisingji, Thakor of Kerwada, M.L.C.

In addition to the Locust Committee already referred to the Imperial Council of Agricultural Research has set up a permanent Sugar Committee which recently paid a visit to this Presidency. Financial stringency has delayed action being taken on those recommendations of the Royal Commission on Agriculture in India (1928) which involve appreciable expenditure, but this subject is dealt with in detail in a separate publication entitled "Report showing the progress made in giving effect to the recommendations of the Royal Commission on Agriculture in India, Part II—Local Governments and Administrations."

CHAPTER II

AGRICULTURAL RESEARCH

In view of the special attention which has been focussed upon agricultural research as a result of the establishment of the Imperial Council and Provincial Committees it seems desirable to give a resumé of the principal current research undertaken by the Department of Agriculture.

PLANT-BREEDING

For some years past plant-breeding has constituted the principal line of research.

Cotton.—Much has been written upon the work on cotton. The Department has, in all, four cotton-breeders with headquarters at the following centres :—

Surat in the Broach cotton tract,

Viramgam in the Dhollera cotton tract,

Dharwar in the Kumpta cotton tract,

Dhulia in the Khandesh (Oomra) cotton tract.

At Surat the well known hybrid 1027 A.L.F. is still the outstanding production of that experimental station. There is however a valuable new cotton known as Surat 5¹ (a hybrid having for its male parent Goghari E5 and its female parent 1027 A.L.F.), which is apparently superior to 1027 A.L.F., at least in ginning percentage, but has the defect of not opening its bolls quite so well as the latter cotton. In the forthcoming season it is proposed to sow this cotton on a large scale and invite a body of experienced cotton-growers to adjudicate on the "opening" defect with a view to deciding whether, taking all factors into account, this new cotton should supersede 1027 A.L.F. There is a small sub-station at Broach controlled by the Surat Cotton Breeder. Here the object is to produce a cotton with an improved fibre without sacrificing the high ginning character associated with local cotton. In the Broach District wilt-resistance is an important character necessary in any improved cotton. Two strains known as Broach No. 8 and Ghoghari A-26 possess this character to a considerable extent. Several new hybrids both at Surat and Broach have been produced and are in process of evolution, the object being to build up a cotton having higher ginning and spinning values than the standard 1027 A.L.F.

At Viramgam the most promising cotton, so far produced, has been Wagad No. 8. This is a straight selection from local Wagad. In trials it has surpassed the local standard both in yield and ginning percentage; and trials are now being arranged in cultivators' fields. Another promising cotton produced at this station is Cutch No. C 331. A considerable amount of new raw material has been recently secured; and both selection and hybridization operations are in progress.

At Dharwar the valuable improved cotton known as Dharwar No. 1 has had to be replaced by another improved cotton known as "Jayawant", owing to the former's susceptibility to wilt. It is fortunate that the "Jayawant" variety, which is a hybrid cotton, should not only be markedly wilt-resistant but also a high spinning cotton. In the recent tests at Matunga technological laboratory this cotton headed the list with 38 counts against 36 obtained from Dharwar 1. There is another very promising improved cotton which is a hybrid between Dharwar No. 1 and Wagale which is nearly as good as Jayawant in spinning and superior to the latter in colour and ginning percentage. Several other hybrids are under study.

In the absence of a breeding station for Dharwar-American cotton some work is being done on this variety at Dharwar. The best improved American Cotton is known as Gadag No. 1 and this strain has been widely introduced into the countryside.

At Dhulia where the work is partly financed by the Indian Central Cotton Committee the most promising improved cotton hitherto produced has been "Banilla". This cotton, however, gave unsatisfactory spinning results in the year under report and the cause is being carefully investigated. The spinning test at Matunga of the Jalgaon sample of this cotton was only 15 counts in the year under report against 19s and 21s in the two preceding years. In the meantime the public are very interested in this cotton, and a considerable area was sown with it in the year under report, and the produce realized a premium of Rs. 22 to 36 per khandy of 784 lbs. lint over the price of "N.R."; while the premium offered for seed-cotton over that of "N.R." was Rs. 4 per maund of 84 lbs. of seed-cotton. This cotton is a hybrid between Bani and Commilla, and there are several other strains of this and similar origin under trial.

Work on the well-known "N.R." cotton continues because, apart from spinning, the best strains of this cotton have never

been surpassed in Khandesh by any other cotton, considered from the standpoint of cultivators' profit. The object of this work is to evolve high-ginning and high-yielding strains. The best ginning strain, so far evolved, is known as "U. 19," this cotton has a ginning percentage of 39. Both of these cottons, Banilla and "N.R." are susceptible to wilt, and hence wilt-resistant strains are being selected.

Rice.—Rice-breeding is in progress at four centres as noted in the margin. The most important breeding station, however, is Karjat where the Crop Botanist is responsible for the work. Three principal varieties of rice are under study at this station, namely, Kolumba, Ziniya and Bhadas. Hitherto the best improved late strain in the Kolumba variety has been known as "K. No. 42." Recent trials of newly evolved strains resulted in "K 226" out-yielding the standard "K 42" in a carefully replicated scheme. Among the mid-late strains of Kolumba variety "K 401" has proved the best. In the Bhadas variety the most promising strain is "B No. 52."

At Ratnagiri, in the Patni variety (a coarse rice including early and intermediate types) of rice, the improved strain "No. 6" has done best in the year under report, yielding 23 per cent. more grain than the local patni. This strain is suitable for highlying lands. The Kudai strains Nos. "25" and "42" have given greatly increased yields over local patni on lowlying lands. Among the intermediate strains Panwel No. 61 has done very well. Among the late strains the following are the best; Nos. 92, 98 and 198.

At Kumpta in Kanara District the most promising strains are Nos. 1061, 1012 and 1315.

At Mugad in Dharwar District several improved strains have been evolved which yield 20 per cent. more than the local variety. The best of the Mugad early strains is "No. 161"; while Nos. "81" and "249" are the best intermediates, and "141" the best late Mugad. The three best Antersal strains are Nos. "67", "90" and "200".

Wheat.—Breeding work is carried on by the Crop Botanist at Poona pending the opening of a special wheat breeding station at Niphad in the Nasik District where about one quarter of the total wheat crop of the Presidency proper is grown. The Bansi variety of wheat has received special attention but the improved yielding strains, so far evolved, appear to be susceptible to rust.

In the Baxi variety of wheat a superior strain "S.P. 33" has been isolated. Efforts to obtain rust-resistant strains have resulted in the selection of Suddhe "No. 11", an Ahmednagar variety, and two strains from Niphad, numbered "7" and "10" respectively. Hybridization has been adopted with a view to obtaining rust resistant wheats having the good qualities of Bansi wheat.

Tobacco.—There is one Tobacco-breeding station which is located at Nadiad. The best known improved strain is Gandiu "No. 6", but in the Piliu variety strain No. "28" has given a yield of $13\frac{1}{2}$ per cent. over the local variety. Hybridization is in progress and several crosses are in the F_3 generation.

Jowar.—Jowar-breeding is in progress at Surat (and its sub-station Broach) and has recently been started at Mohol in the rabi-jowar tract of the East Deccan.

At Surat the most promising Budh Perio variety evolved is "No. 53". In a fully replicated test this strain yielded 15 per cent. more grain than the local strain, which is in conformity with previous results.

Other crops.—Breeding work is also in progress on Bajri at Poona, Dhulia and Nadiad; on castors at Poona and Nadiad and on groundnuts at Dharwar.

DRY-FARMING

This research was continued at the dry-farming research station near Manjri. The object underlying this research is to discover ways and means of making better use of the rainfall in the Bombay Deccan which is one of the most precarious tracts in the whole of India. The staple crop is rabi-jowar and it is cultivated on an area of over three million acres in the three districts of Ahmednagar, Sholapur and Bijapur alone. It has been found that out of an average rainfall of 20 inches only about 2·8 acre-inches of water are actually taken up by an acre of crop under existing farming methods on medium deep soil, whereas by the dry-farming system this quantity can be increased by $1\frac{1}{2}$ acre-inches or over 60 per cent. It has been further ascertained that it takes about 300 lbs. of water to produce 1 lb. of dry matter; hence an acre-inch consumed by the crop means 600 to 700 lbs. of dry-matter (grain and bhusa), so that the additional consumption of $1\frac{1}{2}$ acre-inches means an increased crop of about 1,000 lbs. (made up of 380 lbs. of grain and 620 lbs. of fodder) in a normal season. In a

bad year this saving of moisture may mean the difference between no grain and a fair crop. In the year under report the study of run-off has been taken up, and it was ascertained that out of a total rainfall of 18 inches approximately 6 inches ran off the field where the slope was three per cent. The whole of this run-off took place on 11 days when approximately 13 inches of rain fell, so that during heavy rainfall periods it can be said that nearly 50 per cent. runs off a field having a slope of three per cent. The best method of preventing this run-off apart from bunding is being investigated.

The comparative yields of rabi-jowar, obtained in the year under report, were :—

Treatment	Yield in lbs. per acre	
	Grain	Bhusa
Dry-farming	1,255	1,937
Ordinary	844	1,270

Particulars of results obtained on cultivators' fields will be found under the section of this report which deals with Propaganda, *vide* page 31.

An enlarged scheme of research has recently been prepared for the consideration of the Imperial Council of Agricultural Research. The significance of this method of stiffening the economic condition of the Deccan, is now generally recognized and the Bombay Provincial Banking Enquiry Committee have laid special stress upon it in their report.

CATTLE BREEDING

Cattle-breeding is being carried on at four principal centres in the Presidency proper, namely,

Chharodi in Ahmedabad District,
Surat in Surat District,
Bankapur in Dharwar District,
Poona in Poona District.

At Chharodi the primary object is to produce a first class Kankrej draught animal. This breed is a dual purpose one but its main function is draught as the people prefer buffalo's milk to cow's milk. Several stud-bulls are employed, and a

detailed study is made of the stock got by each bull, with special reference to the strong points and weak points (if any) of that bull.

At Surat the primary object is the same as that of Chharodi, but this herd has been more particularly associated with dairying.

At Bankapur the breed is the Amrit Mahal, and the stock have been mainly obtained from Mysore. The object is to grade up the local Dharwar breed of cattle for draught purposes. The Livestock Expert has found himself confronted with numerous problems in carrying out this plan; for example the female stock have proved much superior to the male stock. This phenomenon is receiving special attention, and it has been brought to the notice of the Imperial Bureau of Animal Genetics at Edinburgh University, which is specially qualified to advise on such problems.

At Poona the College Dairy provides some facilities for breeding owing to the maintenance of a herd of Surtee buffaloes and a herd of Sindhi-red cows. The object here is to evolve improved milch strains in both breeds. As some of the records extend over a period of 30 years the opportunities to study hereditary characters are considerable.

In Sind there is one cattle breeding station at Phihai near Karachi where there is a fine herd of Sindhi-red cattle. The object of this station is to conserve this valuable breed and to evolve improved milch strains. Some 18 cows in this herd have exceeded 4,000 lbs. of milk per lactation, while two have exceeded 7,000 lbs. in the year under report.

PLANT-PATHOLOGY

Several important pieces of research are in progress in this section. Formerly copper-sulphate was the specific treatment of jowar grain to prevent "Smut" disease. This has now been discarded in favour of the dry-sulphur treatment which is both simpler and cheaper. The *Sclerospora* disease of jowar has been carefully studied and it is believed that this fungus is split into specialised races. Preliminary work has been done on the Mosaic disease (leaf curl) of chillies, and a scheme of research, on this disease, has been placed before the Imperial Council of Agricultural Research. Another disease recently taken up for study with the aid of funds from the Sir Sassoon David Trustees is the "brown-spot" disease of rice in Sind. Other diseases under investigation are (1) the wilt of the betel-vine in which two fungi are involved, (2) jiru-

blight and powdery mildew, (3) Sann-hemp wilt and fig-rust. Very successful results have been obtained in the dusting treatment of the grape-vine against powdery mildew. The research scheme on cotton-wilt which is financed by the Indian Central Cotton Committee is being carried on, but it appears that the most successful practical action that can be taken against this disease is the production of wilt-resistant strains of cotton. The Cotton-breeder at Dharwar has been very successful in this respect, and the new strain called Jayawant is an example of this success.

PLANT-PHYSIOLOGY

The two principal schemes deal with the physiology of cotton. These are financed by the Indian Central Cotton Committee. One is at Surat and the other at Sakrand (Sind).

The work at Surat is now far advanced, and the general indications are that the magnitude of the yield of cotton in Gujarat depends very largely upon the available nitrogen within the reach of the roots of the crop in the late months of the year (November and December). Attention is accordingly being concentrated upon the practical methods which are calculated to bring about this condition and to ensure the necessary amount of soil-moisture to enable the plants to take up this plant-food.

In Sind problems connected with cotton growing under perennial irrigation are being investigated. For example the determination of the best sowing date for different varieties of cotton is very important as the available range of time is several months, and yields seem to be materially governed by the sowing date; the exact water-requirements are also being studied as well as the reaction of different varieties to several other environmental factors, such as soil temperature. Owing to the large amount of alkaline salt in Sind soil it is of the greatest importance to determine the relative tolerance of different varieties of cotton to these "kalar" salts. This is a complicated problem because the effect of these salts is different in different soils, in other words the damage is not merely toxic but indirect resulting from the injurious effect of salts upon the physical condition of the soil. It has been found that high grade cottons like Egyptian perform very poorly on soils, the physical condition of which has been damaged by alkaline salts.

ENTOMOLOGY

The cotton boll-worm research scheme (financed by the Indian Central Cotton Committee), at Surat, is in its last year ; and the general conclusion is that control of this pest demands the thorough clean-up of the countryside, between successive crops, of all cotton-stubbles and stray plants of cotton and other malvaceous plants. To test this conclusion a large scale scheme embracing 500 square miles is now under preparation, which will be financed by the Indian Central Cotton Committee.

The Research Scheme on the Jowar stem-borer at Surat, financed from the Sir Sassoon David Trust Fund, has also been completed, and it has been ascertained that the best method to control this pest is to prevent its emergence in the monsoon season from the kadbi fodder and stubbles of the previous year. The most effective method of achieving this object is by chaffing the fodder before storage and the sunning and burning of the jowar stubbles.

HORTICULTURE

Reference has been made in previous reports to the investigations carried out on the problems connected with the preparation of fruit juices from such fruits as the jambul and the lime. Further research is necessary and a scheme has been prepared for the consideration of the Imperial Council of Agricultural Research. Work on the preparation of other fruit products including the candying of the bor fruit and the preparation of syrups has been in progress. Much attention has been given to problems connected with the mango. Packing experiments have demonstrated the superiority of wooden cases over bamboo baskets as regards cost and condition of fruit on arrival at market. Experiments in grading mangoes have shown that it pays to do so. Trial consignments of mangoes to Europe have arrived in good condition when carried in the cool-room of the ships, where the temperature ranges from 40° to 45° F. A research scheme for the full investigation of the problems connected with the export of mangoes to overseas markets has been prepared for the consideration of the Imperial Council of Agricultural Research. Improved strains of guava have been examined by the Crawford Market Authorities, and the report shows that they are a striking improvement upon the bazaar sample. Similarly the "Kabuli" pomegranate fruit has been examined and found to be a great improvement upon the local types as it has soft seed, abundant juice and agreeable taste. Hitherto very

little work has been done on the improvement of vegetables. A scheme has been prepared to place the work on a satisfactory footing.

SOIL FERTILITY

The work on the recuperation of nitrogen in the Deccan soils was completed in the year 1928-29; and similar work was taken up on other important soils in the Presidency. The results of this work are valuable and will shortly be published. The study of the "Karl lands" in the Karnatak was continued; here the problem is to cause these soils to absorb more of the rain-water and to part with it more easily to the crop. The problem of how to make fertilizers effective on non-irrigated rabi crops is under investigation; this involves a study of the movements of these fertilizers in the soil.

AGRICULTURAL ENGINEERING

The modified improved seed-drill has been granted a patent from the Patent Office, Calcutta. Suggestions for additional improvements have been received and these are being incorporated into this machine. One of these is a very simple device for raising the machine out of the ground at the turns; another is for the regulation of the quantity of seed in the seed-hopper; a reduction in dead weight is a third improvement. Special precautions have been taken to ensure that the price of this machine shall not exceed Rs. 50 to Rs. 60.

The improved winnowing machine is suitable for the four crops—wheat, oats, jowar and bajri. The final trial of this machine showed that an excellent sample of grain can be produced for 5 annas per 1,000 lbs. against 15 annas by the old winnower in use on the College Farm. The cost of this new winnower, manufactured at the Cooper Engineering Works, is Rs. 195. An attempt is being made to design a groundnut lifeter, similar to Howard's Potato-digger. Comparative tests are being made between the standard C.T. 2 iron plough and the Bahadur No. 2 plough made at the Cooper Engineering Works, Satara. The Agricultural Engineer has devoted a considerable amount of time to the design of a soil-sampling machine for Sind where samples down to a depth of 30 feet are required in large number. As a result of his experiments the Agricultural Engineer has produced a very efficient portable (on a camel) machine having a collapsible folding derrick. This work is likely to influence the future design of the ordinary water-boring machines.

CHAPTER III

**AGRICULTURAL PREPARATIONS IN SIND, ASSOCIATED WITH
THE BARRAGE IRRIGATION SCHEME**

This huge irrigation scheme is rapidly approaching completion as regards its main features. Agricultural Research which should form the basis of a sound system of farming the province, under perennial irrigation, has been unduly delayed for reasons which need not be mentioned here.

Important proposals for the expansion of the Department of Agriculture and for the provision of agricultural services, were placed before the Legislative Council in August 1929, and these were generally approved.

The principal features in those proposals may be summarized as follows :—

I.—The establishment of two Agricultural Research Stations, one on the Right Bank of the River and one in East Sind, in addition to Sakrand which has been established on the Left Bank of the River in Middle Sind. The former of these stations would tackle the main problems associated with rice. The East Sind station would deal with similar problems to those undertaken at Sakrand, under markedly different conditions, particularly soil and alkaline salt problems, because these problems are much more formidable in East Sind, than in Middle Sind, where successful farming under perennial irrigation is a more difficult proposition.

II.—The establishment of six seed-farms, four on the Left Bank of 2,000 acres each and two on the Right Bank of 1,000 acres each. These seed-farms would not only be the primary sources of seed of improved varieties of the staple crops of cotton, jowar, wheat, rice, etc., but would also be models of agricultural management, incorporating every practical agricultural improvement, both as regards technique and organization. The general plan of management would be based on the experience already acquired at Mirpurkhas and at Chellaro. Ten per cent. of the land would be under the direct management of the Department and 90 per cent. would be conducted through the medium of tenants (haris). It has been computed that seed-farms, of this magnitude, if supplemented by a series of private seed-farms, would be

sufficient to ensure the adequate supply of good seed of desirable varieties of the staple crops to the whole countryside under the command of the Barrage Canals.

III.—*The provision of a Propaganda Service.*—In order to guide the development of the country into the proper channels it is considered necessary to provide a very strong propaganda organization. Each taluka (or similar area) should be provided with an experienced agricultural officer assisted by three kangars. As there are 34 talukas the propaganda staff on this basis would be a large one, and hence two Deputy Directors of Agriculture to control it would be necessary.

IV.—*The provision of depots for Agricultural Requisites.*—Conveniently located depots, within reasonable reach of Zemindars' holdings, where seed of the improved varieties of the staple crops is obtainable and where implements and fertilizers are stocked, will constitute one of the great needs of the countryside. One such depot in each Taluka has been recommended.

V.—*The establishment of an Agricultural Engineering Section.*—In a country, much underpopulated, the importance of machinery, as a means of rapidly developing cultivation, requires no emphasis. Moreover the financial aspect of the Barrage scheme, from the standpoint of Government, depends largely upon the rate at which the country is developed. Vigorous action in demonstrating the possibilities of power-cultivation is called for.

In addition to the foregoing items provision was also made, in the proposals, for livestock-improvement; investigating the possibilities of dairying so as to facilitate "mixed-farming", dealing with crop protection from pests, especially locusts; investigating the possibilities of fruit-crops and agricultural education.

In order to carry out such a programme it is essential that the Department of Agriculture, in Sind, should be provided with a strong staff of agricultural experts. An important step in this direction has recently been taken by Government in appointing Mr. W. J. Jenkins to be Chief Agricultural Officer in Sind, with effect from the 1st June 1930.

The work at the Sakrand Agricultural Research Station is now well organized and good work is being done in the several sections of Botany, Soil-physics and Agriculture-proper.

Some of the results obtained in the year under report with cotton are very impressive as may be gauged from the following statement :—

Date of sowing	Mean yield of seed cotton in lbs. per acre					
	Sindhi	Punjab American		Egyptian	Imported American	
	27 W.N.	4 F	285 F	Asmuni	Acala	Hartsville
23 April	2,094	1,939	1,828	1,032	1,139	..
12 May	1,940	1,568	1,496	1,110	947	710
17 June	708	714	568	469	213	213
Average	1,580	1,407	1,297	870	763	461
Yield ratio	2.0	1.8	1.7	1.1	1.0	..

These figures were obtained in a carefully replicated test ; there were six replications in the case of April and May sowings and four in the case of June sowings. Moreover the results are almost identical with those obtained in the previous year. These very high yield figures are not confined solely to favoured plots on Government farms. They are attainable by cultivators on good land with a good water-supply.

It is also important to note that these results confirm the conclusions arrived at in a paper read before the Science Congress some six years ago in which I expressed the opinion, based on Mirpurkhas experience, that the future cotton of Sind would probably be founded on "Punjab 4F". The cotton known as "27 W.N." is the best strain of Sind deshi cotton, which was evolved many years ago at Mirpurkhas. This is a non-staple cotton, but the figures indicate that it will only be ousted by a staple cotton provided the price margin of the latter is substantial, because the ultimate criterion for judging cotton must always be the balance-sheet of the cotton-grower. The position is further complicated by the fact that there is so much alkali salt in the Sind soils, which is distributed unevenly throughout the countryside. For this reason, in judging the merits of any cotton in Sind, it is always necessary to examine its alkali resisting powers ; so far no introduced cotton appears to be more resistant to alkali than the local deshi variety. Hitherto it has been very difficult to give American cottons a reasonably satisfactory trial in the district, on a big scale owing to the unreliable character of the canals ; but in the

current season (1930) the Jamrao canal has worked satisfactorily, and the area under Punjab American 4F has risen to some 60,000 acres on the Southern Jamrao ; and hence it would seem that this locality will definitely adopt this cotton as soon as the barrage water is available.

The central problem being tackled by the Agricultural section proper at Sakrand is the best system of farming the countryside under perennial irrigation so as to achieve the double object of combating alkaline salt and ensuring the maintenance of soil-fertility. Several rotations, containing varying percentages of berseem (Egyptian clover), have been laid out ; and the remarkable effects of this crop upon soil fertility are already apparent. This is a leguminous fodder crop, and hence it is not a money crop unless some form of stock-farming can be associated with crop-farming. Preliminary investigations conducted at Sukkur show that berseem forms an excellent basis for dairying, and it is proposed to investigate this possibility further by adding a buffalo herd to the Sakrand equipment. Two other possible objections have been raised against berseem—

(1) hitherto seed-production in Sind has proved rather difficult, and

(2) the "duty" of a cusec of water is 100 acres as against a "duty" of 200 acres in the case of other rabi crops like wheat.

It should, however, be pointed out that other parts of India have been faced with the former of these problems and have solved it. As regards the second point it is necessary to remember that the object of growing berseem is primarily to maintain the fertility of the land and that this will probably be difficult to achieve without it. The only largely-available alternatives (partial or whole) appear to be

(a) river silt, and

(b) synthetic farm-yard-manure made out of waste organic matter such as crop-stubbles.

It is probable that the silt received from the perennial canals, by itself, will not prove adequate. The possibilities of synthetic manure will be fully investigated.

CHAPTER IV

SERVICES RENDERED TO THE PUBLIC

IMPROVED SEED

One of the chief activities of the Department is to organize the seed-supply of all the superior varieties of crops which have been bred by the Department or introduced from without. These operations are conducted on a substantial scale, especially as regards the cotton crop. An important development has taken place in the year under report owing to the Indian Central Cotton Committee deciding to subsidize work of this character in addition to research, to which it has mainly confined its financial aid in the past. With the aid of funds from this source it has been possible to expand operations at the following three centres—

Name of centre	Finance required in*					
	1930-31			Subsequent years		
	Advance	Subsidy	Total	Advance	Subsidy	Total
Surat	..	7,000	7,000	..	7,000	7,000
Hubli	33,600	6,560	40,160	80,000	8,560	88,560
Gadag	48,000	7,015	55,015	80,000	9,240	89,240

At Surat the whole operations are in the hands of the Department of Agriculture ; and this extension work is located on the north side of the Tapti. At the other two centres the operation is partly under the control of the Department and partly entrusted to the Cotton Sale Societies.

These seed distribution schemes are organised differently at different centres in accordance with local conditions, but where the co-operative movement is popular it is desirable to make the fullest use of this agency. The best organised seed-work is to be found in the Southern Division where it takes the form of a succession of " waves " or stages as described below,

* The advance money is obtained from the Urban Co-operative Bank at Hubli and from the Central Bank at Gadag. The subsidy is provided by the Indian Central Cotton Committee.

in the case of Dharwar No. I cotton now being replaced by Jayawant:—

Stage	Location	Area sown in acres	Quantity of seed produced in lbs.	Controlling Agency	Remarks
I	Dharwar Experimental Farm.	1	120	Cotton Breeder.	This seed is produced from selfed flowers.
II	Do.	30	8,000	Farm Superintendent.	
III	Primary seed growers' area.	800	1,50,000	Cotton Superintendent and sale society.	The crop is rogued.
IV	Reserved area ..	15,000	20,00,000	Do.	Do.
V	Extension Area ..	2,00,000	24 millions	Uncontrolled.	
VI	Countryside ..	....	....	....	

The seed is handled by the Department of Agriculture up to and including the sowing of the crop in the seed growers' fields (i.e. the beginning of stage III). Here the handling operations are taken over by the Co-operative Sale Society which handles the seed up to the sowing of the crop in the extension area (i.e. the beginning of stage V), under the supervision of the Department. The seed is not further controlled, but it spreads naturally in the sixth stage over the countryside of the Dharwar District.

A similar organisation exists for Gadag No. I cotton which controls the seed-supply for another two lakhs of acres. In this case the seed multiplies less quickly than in the case of Dharwar No. I, and a larger reserved area is therefore organised.

In the year under report the Department of Agriculture handled 25,51,500 lbs. of cotton seed (1027 A.L.F. variety) in the Surat tract. In the Southern Division, at the Dharwar-Hubli, Gadag and Bailhongal centres, the Department of Agriculture and the Co-operative Sale Societies handled together 20,76,624 lbs. of seed in the year under report. In Khandesh the cotton seed operations directly undertaken by the Department of Agriculture were on a smaller scale, where the amount of seed distributed was 27,000 lbs. (18,000 lbs. of "N.R." and 9,000 lbs. of Banilla), but the subsequent stages of this work are managed by registered seed-growers and Taluka Development Associations, the cotton staff of the Department assisting the former to rogue their crops. In Sind the Department handled 6,06,710 lbs. of seed of improved 'deshi' cotton

"No. 27 W.N." and 54,990 lbs. of "4F" American. The latter cotton is now well established on the Jamrao Canal especially in the southern half where it is expected to oust deshi as soon as a reliable water supply is received after the completion of the Sukkur barrage.

As regards wheat the principal seed operations of the Department are located in Sind where 62,767 lbs. of seed, mostly Pusa 12, were distributed.

As regards rice the Konkan is the most important tract in the Presidency proper. In this division the total quantity of seed distributed by the Department in the year under report was 48,395 lbs. (made up of the following varieties Kolamba No. 42, 10,100 lbs., Kolamba No. 79, 2,440 lbs., Kudai, 2,455 lbs. others 33,400 lbs.). In Sind 41,926 lbs. of rice seed were distributed. This consisted mostly of the Kangani variety. There appear to be great possibilities in Sind of promoting rice seed-operations through the co-operation of large land-owners; for example Khan Bahadur Khuhro, one of the largest Zamindars in Larkana District, has recently arranged (the kharif of 1930) to have the whole of his estate sown with improved strains of rice; care being taken to see that not a single maund of ordinary seed was sown.

Seed operations with other crops include jowar, groundnuts and tobacco.

SEED-GRADING

Much success has been achieved in the Deccan through the adoption of grading seed. This is a very simple operation which can be done with the aid of hand sieves. The Department graded about two lakhs of lbs. of seed in the Sholapur District where the Taluka Development Associations are taking up this work. The average increased yields of rabi jowar in this district have ranged from under 30 to over 60 per cent. during the past three years in this district, wherever grading has been adopted, and this practice is being widely taken up. Seed-grading is an excellent complementary operation to dry-farming. Where both were combined in Ahmednagar District in the year under report the increased yield, on an average of a large number of plots, was 65 per cent. of rabi jowar grain.

PREMIUM-BULLS

There is a great demand for premium-bulls, especially those which are bred at Chharodi. Altogether there were 45

"A class" premium-bulls on the 1st July 1930 in the seven breeding zones referred to on page 23 of last year's report, and 32 in the rest of the Presidency.

BORING FOR WATER

The Department of Agriculture has been assisting the public for over 21 years to increase the water supply in their wells, and a recent computation showed that 2,10,088·6 feet had been bored and about 3,136,277 gallons of water per hour had been added to the wells of the Presidency. In the year under report there were 29 boring machines working under the direct control of the Agricultural Engineer and 28 machines working under the five Presidency Deputy Directors of Agriculture. Altogether 318 bores were made resulting in the tapping of 113,391 gallons of water per hour. The total footage bored amounted to 22,678·6 feet.

WATER-FINDING.

The Agricultural Chemist to Government controls the work of four machines for locating underground water. Last year 413 sites were tested for the public while in the year under report the number has gone up to 746. Poona District stands first with 159 and Sholapur next with 137. Up till now, on ten sites selected in the year under report, wells have been sunk and all have been successful.

LAND-IMPROVEMENT

The Department employs four whole-time officers in the Deccan and Karnatak to assist the public in laying out tals (field embankments) on their lands. Tal-making is an old practice but it was found that the alignments were generally faulty and the waste weirs situated at wrong positions. There is now a great demand for expert advice which cannot be satisfied by the small staff available. In the Bijapur District plans and estimates were prepared for 32 bunding schemes, costing Rs. 41,800, in 30 villages and for 14 reclamation schemes of small nala beds, costing Rs. 17,100. In Belgaum and Dharwar Districts 45 bunding schemes, dealing with 700 acres, in seven villages, were prepared. A large joint-scheme dealing with 313 acres at Tallur is under preparation. In the Deccan where there is only one bunding officer 71 direct applications from the public and 34 through the Revenue Department were received. In the North Central Division (Khandesh and Nasik), where this kind of service has only recently been organized, the bunding officer has dealt with 51 schemes.

MECHANICS

Each Deputy Director has on his staff a Mechanical Assistant whose duty it is to assist the public in preparing estimates for power-plants and in the erection and inspection of these plants. This kind of assistance is greatly appreciated and the demand for such aid from the public has much increased. In the Deccan for example, during the year under report, the Mechanical Assistant dealt with the following power-plants :—

(1) 18 B.H.P. hot start, National Crude Oil Engine with 3" Gwynnes centrifugal pump ; 2 flour mills with a 2½" countershaft (Belapur, District Ahmednagar).

(2) 15 B.H.P. cold start, " S.I." type Blackstone Crude Oil Engine with a 45" Chattanooga mill and 2 flour mills (Surwad, Post Bavada, Taluka Indapur).

(3) 22 B.H.P. cold start, Ruston Hornsby, 4H. type Crude Oil Engine with 92" Chattanooga mill (Co-operative Agricultural Implement Society, Nanded, Taluka Haveli, Poona District).

(4) 5 B.H.P. Petter " S " type vertical engine with a 3" × 4" Pulsometer centrifugal pump (Surwad, Taluka Indapur, District Poona).

(5) 5 B.H.P. Petter " S " type Crude Oil Engine with aquatole (Desundi, near Rahuri, District Ahmednagar).

(6) 8 B.H.P. Petter (cold start) " S " type vertical Crude Oil Engine with 3" × 4" Pulsometer pump (Mhaswad, Taluka Man, District Satara).

(7) 12½ B.H.P. " 3 M type " Ruston Hornsby Crude Oil Engine with 3" pulsometer pump, huller and a rotary oil mill (Dhom, Taluka Wai, District Satara).

In addition he prepared estimates for 37 power-plants. In the Deccan Canal Zone there are now 78 power-cane-crushing mills.

In the Karnatak the Mechanical Assistant was also kept very busy ; thus in Bijapur District he erected five oil-engines, seven centrifugal pumps and four grinding mills for agricultural purposes ; while plans and estimates were prepared for nine pumping plants. It is interesting to note the localities in which power-pumping is developing ; these are Chikodi Taluka in Belgaum District and Bijapur and Indi talukas of the Bijapur District. In Gujarat the Mechanical Assistant erected four pumping plants, advised, after inspection, upon 24 plants, repaired five plants and prepared surveys and estimates for 15 plants. In Khandesh similar work was undertaken.

CROP PROTECTION

The distribution of copper-sulphate for steeping jowar seed as a preventive of jowar smut disease has been a prominent feature of the Department's services to the public for several years. This was continued in the year under report but an improvement has been evolved through the substitution of sulphur (powder) for copper-sulphate. This treatment has special advantages over steeping in copper-sulphate because the material is used in the powder form and not in the liquid form necessary for copper-sulphate. Thus the seed after treatment is not unfit for purposes other than sowing, should sowing have to be abandoned for any reason. The danger of poisoning is eliminated and the cost per acre* is brought down from seven pies to one pie.

In Gujarat 71 packets of arsenic and 527 packets of strychnine hydrochloride were distributed for poisoning pigs and jackals. The Department continues to promote fencing schemes in the Southern Division to protect crops from pig, but the need of legislation is keenly felt to require small minorities to come into line with the wishes of a majority of the people desirous of undertaking a co-operative scheme. Absentee landlords constitute a serious difficulty in organizing joint action. One important joint scheme is being undertaken at Arbhavi in the Gokak Canal tract which will protect 8,000 acres at a cost of Rs. 14,000. In Mundgod Division individual cultivators purchased 10 miles of fencing material during the year under report. During the past two years, 31 cultivators of six villages have fenced an area of about 1,049 acres with 17 miles of wire-fencing.

In the Deccan the system hitherto found most suitable for protecting crops from pig has been hunting with guns and dogs.

Name of group	Amount in rupees	In the year under report seven campaigns were conducted and the results are tabulated on page 105 in Appendix D of this Report. The marginally noted amounts were collected from the villagers concerned, towards the cost of these operations.
Palsi (Satara District) ..	189	
Godavari Canals ..	1,000	
Mungi (Ahmednagar District).	175	
Sinhagad (Poona District) ..	200	

*This assumes a seed-rate of $7\frac{1}{2}$ lbs. per acre. The cost of treating 100 lbs. of seed in each treatment is

$8\frac{1}{2}$ annas in the case of copper-sulphate and

$1\frac{1}{2}$ annas in the case of Sulphur dust.

The campaign against deer in the Dharwar District was continued in the year under report. The public subscriptions amounted to Rs. 740, and 136 deer were killed ; while the area protected was 12,000 acres. The Gadag and Ron Taluka Development Associations also organized campaigns against deer.

The wingless grasshopper which has done such a great amount of damage in recent years throughout the Deccan and Karnatak, was not so troublesome in the year under report but the pest was still serious in Chandor and adjoining talukas in Nasik District. Hence in the year under report an area of 300 acres, on the border line between the affected and non-affected zones, was taken in hand by the Department. The "tin and tar" method was adopted and it was demonstrated that the pest could be kept under control ; and as a result of this demonstration, action was taken by cultivators in some 42 villages in the Chandor taluka.

The Belgaum Rice-hopper Committee destroyed 40,000 lbs. of hoppers at a cost of Rs. 3,000.

Reference has been made on page 2 *ante* to the campaign waged against the locust pest in Sind.

REDUCING "COSTS" OF PRODUCTION

The great slump in prices brings the problem of "costs" into special prominence. This Department has been giving special attention to this problem in connection with the sugarcane crop for some years. As a result of the economics worked out at Manjri the cost of producing cane at that experimental station is now approximately 8 annas* per Bengal maund of plant cane, while on the sub-station near Kopergaon on the Godavari Canal the cost is 7 annas for plant cane and 6 annas for ratoon cane. The average Irrigator's cost is still in the neighbourhood of 10½ annas* per maund ; and propaganda is being carried on to assist the irrigators to bring down their costs. The Department hopes to be able to show that a substantial further reduction in cost is possible when the improved strains of thick canes, now being evolved at the Imperial Sugarcane Research Station at Coimbatore, have been supplied to the Deccan. Experiments are also in progress to ascertain whether the quantity of nitrogen applied per acre can be still further reduced below that adopted in the standard "Manjri system" of cultivation.

* All these figures (except at Kopergaon where the wage is 8 annas) are arrived at on the basis of contract and hired labour and a 10-anna wage. A peasant would generally be willing to cultivate his own land on a much lower wage.

POULTRY-STOCK

The Department continues to promote the improvement of poultry-breeding by distributing good stock birds from the Central Poultry Farm at Poona, so far as the very limited funds permit. Good work is being done in the countryside at a number of centres including Rahuri in Ahmednagar District, Tallur and Savandatti in Belgaum District and Annigeri in Dharwar District. Considerable progress with the leghorn is reported from Bijapur District while the American Mission at Sangli is also playing a useful part in improving poultry.

CHEMICAL ASSISTANCE

The Agricultural Chemist continues to undertake the analyses of a very large number of samples of soils, manures, waters and feeding stuffs for the general public and to give advice based on these analyses. In the year under report 319 samples, received from the public, were dealt with. In addition 898 samples received from Government Departments were dealt with.

TAGAI APPLICATIONS

Many applications for tagai are referred to the Department of Agriculture by the Revenue and Co-operative Departments, especially with regard to land-improvement schemes. This arrangement ensures to the cultivator that his application will be dealt with on its technical merits. Thus in the Karnatak, in the year under report, applications for loans amounting to Rs. 65,100 were dealt with.

TRAINING CLASSES FOR ADULTS

One of the most effective services which can be rendered to the public by the Department of Agriculture is technical instruction to professional agriculturists. In the year under report three types of these classes were organized in the Deccan..

Place	Subject	Object	Tract served	Period in days	Attendance
Rahata ..	Cultivation of irrigated crops.	Technique proper for such crops as cane, cotton and groundnut.	Deccan Canals ..	10	110
Satara ..	Horticulture ..	Technique of fruit growing.	Satara District ..	10	70
Islampur ..	Land-development.	Technique of embanking land and of iron-ploughing.	Walva Taluka and Shirala peta.	7	40

The class on Irrigated crops at Rahata was also attended by the subordinate staff of the Irrigation Department; while cultivators came from as far a field as Phaltan State on the Nira Right Bank Canal. Mr. Prithviraj Shet of Rahata very kindly made his garden and buildings at Rahata available for this class.

The Horticultural class at Satara was conducted very successfully by the staff of the Horticulturist to Government.

In the Konkan two horticultural classes were organized, one at Ankola which was attended by 36 students from Karwar, Kumpta, Ankola, and Honavar talukas and the other at Jambul which was attended by 53 cultivators. Classes were also arranged at Ratnagiri and Rajapur to teach the best methods of canning mango-pulp, bottling jambul juice and pine-apples.

The "land-development" class at Islampur was organized through the Walva Taluka Development Association.

The practical success of these classes, as judged by subsequent adoption of improvements by cultivators, has been gratifying.

CHAPTER V

AGRICULTURAL PROPAGANDA

The importance of securing non-official co-operation in promoting agricultural improvements through propaganda and demonstration is fully recognized by the Department of Agriculture which gives every assistance to the Taluka Development Associations. It has unfortunately not been possible to multiply the number of these associations in recent years owing to financial stringency; and hence the number has remained almost constant. The actual number of associations in 1929-30 was 84 and the distribution of these associations will be found in Appendix A.

The quality of the work of these associations varies considerably but many of them are doing very useful work. The Satara District Local Board continued to control the working of the associations in that district and to contribute to their finances. In this district the Satara Taluka Development Association undertook the responsibility of managing an adult training class in Horticulture, while the Walva Taluka Association organized and managed a Land-development class. In the Karnatak the Gadag and Ron Associations gave special attention to crop protection operations against deer; the Hangal Association promoted the spread of improved strains of rice and the use of artificial manures; the Haveri Association dealt with the adoption of the "tin and tar" method of combating the wingless grasshopper pest. The Athni Association devoted its attention to promoting cattle improvement. In the Khandesh-Nasik tract the following associations did good work, Raver, Bhusaval, Jalgaon, Pachora, Amalner and Chalisgaon. The Dhulia, Jalgaon and Pachora Associations are able to carry out satisfactorily the duties of supervising the work of Co-operative Credit Societies. Several of the East Khandesh Associations are doing useful work on cattle-improvement through the distribution of premium bulls. In Gujarat the Pardi Association did good work in distributing seed of the improved variety of rice known as Kolamba "No. 79", while the Anand and Borsad Associations continued to do very good work in spreading the improved tobacco strain known as Gandiu "No. 6". In the Konkan several associations have been doing good work. For example the Sirsi Association has sprayed 200 acres of Supari palms against Koleroga disease. The Palghar Association organized 50 demonstration plots and published four leaflets, while the

Dahanu Association organized a very fine agricultural show at Bordi.

In Sind an active programme of agricultural propaganda was carried on through the Taluka Development Associations in Northern, Middle and East Sind. The main lines of work were the popularization of improved strains of cotton, wheat and rice and of improved implements. In the Co-operative movement the non-credit societies come into close contact with the Department of Agriculture. In the Deccan there are two principal types of non-credit societies, namely, (1) Sale Societies, and (2) Requisites Societies. Among the Sale Societies mention may be made of the Haveli Taluka Agricultural Sale Society which handled produce worth Rs. 2,62,425 and the Nira Canals Societies Purchase and Sale Union which handled goods worth Rs. 2,82,894. The Requisites Societies are operating on only a small scale, but two Societies handled machinery worth over Rs. 1,000.

In the Karnatak the Cotton Sale Societies at Hubli and Gadag continued to do good work, and the operations of these societies are likely to expand considerably owing to the subsidies granted by the Indian Central Cotton Committee to promote seed distribution. Below are summarized the sale transactions of the year under report of these two societies and three others :—

Name of Society	Number of members	Share capital in rupees	Number of dokras sold		Total	Value of cotton in rupees
			By auction	By private treaty		
Hubli	2,602	17,390	5,445	11,097	16,542	6,20,500
Gadag	1,580	41,120	11,855	8,612	20,467	8,44,098
Ballhonga	307	4,180	2,245	3,559	5,804	2,01,396
Haveri	75	7,240	1,081	202	1,283	45,623
Bijapur	192	2,865	..	1,297	1,297	68,548

The Nipani Tobacco Sale Society handled over half a lakh of rupees worth of produce ; while the Byadgi Chillie Sale Society handled produce amounting to nearly 4½ lakhs of lbs. worth over half a lakh of rupees.

As regards demonstrations these were of a varied character and conducted on a very large scale. Special mention should be made of the experiment conducted under the auspices of Mr. Macmillan, the late Collector of Ahmednagar District. This was an attempt at mass propaganda in every corner of

the District with a limited number of definite agricultural improvements. The improvements selected were—

- (1) graded *versus* non-graded rabi-jowar seed ;
- (2) dry-farming methods *versus* ordinary methods of cultivation of rabi-jowar ;

The scheme required—

- (1) the preparation of 42 sets of implements,
- (2) the printing of special leaflets,
- (3) the remuneration of non-official demonstrators, in addition to the staff of the Agricultural Department.

Altogether there were 42 centres located in 11 talukas, which for the most part were adjacent to weekly bazaar places. At these centres demonstrations were arranged on cultivators' fields, and the demonstrators explained the improved methods to the public on four occasions during the season. In addition 25 large meetings were held under the auspices of Government officials and local landlords, which were largely attended. Altogether some 4,000 leaflets were distributed and about 6,000 cultivators (besides school children) were brought into direct touch with the improvements demonstrated, and one of the consequences is that cultivators have offered 430 acres of land at these centres for large scale demonstration, while there has been a large demand for improved implements. The average yields obtained on the demonstration plots are summarized in the following statement :—

Treatment	Yield per acre of		Increase per cent.	
	Grain	Fodder	Grain	Fodder
	Lbs.	Lbs.	Per cent.	Per cent.
(1) Graded seed	311	893	19	10
(2) Non-graded seed	269	830	..	..
(1) Dry-farming methods	415	1,054	65	27
(2) Ordinary methods	266	812	..	..

In Sholapur District the special seed-grading propaganda was continued, and 100 plots were kept under observation. The average acreage yield of rabi-jowar from graded seed during the year under report was 455 lbs. of grain against 357 lbs. of grain from ungraded seed. In the canal tracts also very good results have been obtained with graded seed.

As an example of the number of demonstrations which are annually conducted in the several Deputy Directors' divisions,

I may quote the following figures from the report of the Deputy Director of Agriculture, North Central Division :—

Serial No.	Kind of demonstration	Number	Attendance
1	Crop demonstrations	66	Over 4,000
2	Implement demonstrations	65	4,500
3	Power chaff-cutter demonstrations	14	350
4	Silo demonstrations	15	Over 800
5	Demonstrations of boiling of cane juice on Poona furnace.	2	200
6	Demonstration of steeping of jowar in copper sulphate solution.	330	6,000
7	General demonstrations at the time of Jamabandi.	25	2,500

while in Gujarat the number of demonstration plots on cultivators' fields was 266. In the Konkan 214 demonstration plots were laid out on cultivators fields; the big event in this division, in the year under report, was, however, the agricultural show, organized under the auspices of the Dahanu Taluka Development Association at Bordi from the 9th to 12th March 1930. The Show was modelled on the methods adopted at the Presidency Shows held at Poona in 1926 and Ahmedabad in 1928. It was opened by the Honourable Mr. Pradhan, Finance Member of the Bombay Government, and was attended by 25,000 people. In Sind the itinerant system of demonstration has been found very useful; thus a demonstrator equipped with a pair of bullocks and a selection of implements, tours from village to village giving ploughing and other demonstrations on the fields of cultivators. In north Sind 64 villages were visited in this way, while in middle Sind the number was 100. The Deputy Registrar of Co-operative Societies who controls agricultural propaganda in eleven talukas claims that there is hardly a village within these talukas which has not received the message of agricultural improvements during the past 6 or 7 years. In Sind also the Department organized an extensive itinerary of a tractor plough with the aid of a business firm, which was spread over a period of two months. During this time demonstrations were given in 18 villages.

The District Staff have, in addition, given a very large number of lectures and talks and have made good use of magic lanterns.

CHAPTER VI

AGRICULTURAL ECONOMICS, MARKETING AND
LEGISLATION

The most important event of the year under report has been the publication of the reports of the several Provincial Banking Inquiry Committees, including that of Bombay.

These reports together with that of the Central Committee will form a valuable complement to the Report of the Royal Commission on Indian Agriculture published in 1928, because the uplift of Indian Agriculture is closely wrapped up with the problem of financing agriculture, which forms such an important feature of these reports. The Bombay Banking Inquiry Committee's report, *inter alia*, endorses the recommendation* to establish a Board of Economic Inquiry. Some such research organization seems essential because at present economic research in the rural areas of this Presidency labours under the handicap of the absence of an accepted scientific system for investigating the economics of peasant-agriculture.

In the sphere of legislation it may be noted that the Cotton Transport Act continues to serve a very valuable purpose, wherever it is adequately applied. Steps are in progress to establish a new protected zone, to be known as the Narbuddha-Mahi Zone in middle Gujarat. As regards the Bombay Cotton Markets Act it is hoped to bring into existence, at an early date, the first regulated cotton market at Dhulia as the personnel of the market committee has recently been published in the *Bombay Government Gazette*.

* This recommendation was made by the Indian Economic Inquiry Committee and supported by the Royal Commission on Agriculture in India.

CHAPTER VII

AGRICULTURAL EDUCATION

THE POONA COLLEGE OF AGRICULTURE

The following statement shows the number of applicants for admission to the College in June 1930, together with the number admitted and arrived on June 30th (i.e. 20 days after the session opened):—

Origin	Object	Applied	Admitted	Arrived
Bombay Presidency, its Indian States and Sind.	Degree	121	97	79
	Diploma	1	..	..
	Short Course ..	14	9	9
Other parts of India ..	Degree	43	10	9
	Diploma	4	..	..
	Short Course ..	6	2	2
Total ..		189	118	99

It will be noted that there is still a large demand for admittance from students outside the Bombay Presidency. Such students are, however, now limited to ten per cent. of the total accepted applicants.

In addition to the students taking the ordinary courses there are five post-graduates preparing for the M.Ag. (Master of Agriculture).

The least satisfactory feature about the candidates for admission to the College is the relatively low academic qualifications of the applicants. There is a consensus of opinion among the professorial staff that an improvement could be effected by a modification in the degree curriculum. A minor suggestion which has been made is that Government should guarantee, at least, one provincial service post for graduates who take their B.Ag. with first class honours.

AGRICULTURAL SCHOOLS

The six agricultural schools have been conducted on the same lines as hitherto, but proposals have been made to Government for a scheme to test how these schools can be cheapened. At Loni the reduction of scholarships from Rs. 10 to Rs. 8 and Rs. 5 has been tried with the result that there were 73 applications for admission for 22 vacancies. With regard to

the Devi-Hosur school it is gratifying to note that 115 past students are working on their own farms; this is a very popular school as may be gathered from the fact that there were 127 applications for admission in the year under report, thus indicating that the training is more sought after than the degree course of the College of Agriculture. This type of School, which approximates to a Vernacular College of Agriculture, except as regards cost, meets the requirements of farmers' sons, intending to practice agriculture, better than the Poona College which serves a rather different object.

There seems to be a definite desire in the country for agricultural schools. Practical evidence has come from Ratnagiri in the year under report where the Shikshan Prasarak Mandal of Rajapur has started an agricultural school. This association has obtained the services of an agricultural graduate to be head-master from this Department, and it is making a very real effort to make the school a success.

BIAS SCHOOLS

The Department of Agriculture continued to assist the Education Department in matters pertaining to the bias schools, especially as regards examinations and in laying-out the school plots. Teachers for these schools continue to be trained by this Department.

CHAPTER VIII

FINANCE AND ADMINISTRATION

FINANCE

The expenditure of the Department amounted to Rs. 18,63,860 during the financial year 1929-30 as against Rs. 18,28,300 in 1928-29. It is understood that there will be a drastic reduction in the Department's budget for 1931-32, owing to various causes, political and economic, which have brought about such a huge drop in the revenue of the Province. Even now (1930-31) the budget of the Bombay Department of Agriculture has fallen far behind that of the Agricultural Departments of the Punjab and the United Provinces as may be gathered from the following figures for 1928-29 :—

Name of Province					Budget of Department of Agriculture in rupees
Punjab	..	..	..	..	28,62,568
United Provinces	..	..	..	..	25,41,949
Bombay	..	..	..	..	18,28,300

and it is understood that the budgets of these two Provinces is increasing and not shrinking like that of the Bombay Department of Agriculture. The receipts of the Department for the year under report amounted to Rs. 2,85,750 as against Rs. 2,59,700 in 1928-29.

As regards the Personal Ledger Account which is used for financing seeds and implements, etc., the total amount advanced was Rs. 1,01,900, while the recoveries credited during the year were Rs. 97,700. During the year under report Government have been pleased to sanction an additional sum of Rs. 50,000 in the personal ledger account for use in Sind where seed operations are now being conducted on a substantial scale. Of this amount Rs. 25,000 were actually drawn and added to the Personal Ledger Account and Rs. 12,750 were expended in the year under report.

Subsidies were received from the Indian Central Cotton Com-

- | | |
|---|---|
| <p>(1) Rs. 31,830 for Cotton physiology scheme at Surat.</p> <p>(2) Rs. 25,840 for Cotton-wilt scheme at Dharwar.</p> <p>(3) Rs. 18,050 for Earias Boll-worm scheme at Surat.</p> <p>(4) Rs. 24,000 for Cotton physiology scheme at Sakrand.</p> <p>(5) Rs. 5,050 for part cost of Khandesh Cotton breeding scheme at Dhulia.</p> | <p>mittee for the marginally noted schemes, to the amount of Rs. 1,04,770, and the expenditure under this head in the year under report was Rs. 92,150.</p> |
|---|---|

Rs. 1,04,770

The following amounts were received during the year from the Sir Sassoon David Trustees :—

- (1) Rs. 1,358 for investigations in connection with the improvement of grazing lands.
- (2) Rs. 4,910 for investigations in connection with drought resisting crops, especially Bajri.
- (3) Rs. 3,646 for the investigation of the Mango blight problem.
- (4) Rs. 911 for the jowar borer research.
- (5) Rs. 500 Supplementary grant for the testing of new nitrogenous artificial manures.
- (6) Rs. 3,300 for the purchase of a Tractor for demonstration in the Deccan area excluding the West Khandesh District.
- (7) Rs. 7,000 for the Rice-Pathological Research Scheme in Sind.
- (8) Rs. 3,333 for the Castor Research Scheme.
- (9) Rs. 800 Subsidy to the Principal, Sangli Industrial and Agricultural School, for the improvement of the breed of sheep and goats in the Deccan.
- (10) Rs. 1,000 Grant-in-aid to the Local Agricultural School Committee, Dhulia, for the years 1929-30 and 1930-31.

Rs. 26,758 Total.

ADMINISTRATION

The post of the Director of Agriculture was held by Mr. T. F. Main until the 6th September when he proceeded on long leave out of India. For the rest of the year Dr. Burns acted as Director.

Several officers were on leave during part of the year notably Mr. E. J. Bruen (Live Stock Expert) who returned from eight months' leave on 3rd January 1930. Mr. Ali Mahomed Ulvi acted as Live Stock Expert. Dr. Cheema (Horticulturist) was on leave from 10th May 1929 to 9th August 1929 when Mr. H. P. Paranjape acted. Mr. G. K. Ranade (Assistant Professor of Agriculture), Mr. G. B. Patwardhan (Assistant Professor of Botany), and Mr. R. S. Kasargode (Assistant Professor of Entomology) were on leave for short periods and the acting vacancies were filled respectively by Mr. K. S. Kulkarni, Mr. L. B. Kulkarni and Mr. T. N. Jhaveri.

Mr. G. K. Ranade, Assistant Professor of Agriculture, retired on reaching the age of superannuation on the 15th November 1929 and was succeeded by Mr. K. S. Kulkarni. Mr. Ranade was brought to the college in its early days where he put in many years of useful work. Previously he was agricultural teacher at an Agricultural Training School in Dharwar where his management of the attached farm favourably impressed the officers of this Department and led to his transfer to Poona. Mr. R. S. Kasargode, Assistant Professor of Entomology, retired prematurely on invalid pension. This officer's retirement is a real loss to the Department of Agriculture as he was a very competent officer who was a genuine enthusiast in his subject.

The following officers were on deputation during the year—Mr. W. J. Jenkins with the Government of India, as Deputy Secretary, Indian Central Cotton Committee; Mr. G. S. Kulkarni, with the Indian Central Cotton Committee; Mr. J. P. Trivedi, with the Bhavnagar State; Mr. H. G. Baluch as Secretary of the Cattle Committee, Sind; Messrs. V. A. Tamhane and K. I. Thadani under the Lloyd Barrage Development Scheme.

These vacancies were filled respectively by Mr. K. M. Pawar, Dr. B. N. Uppal, Mr. A. A. Vasawda, Mr. M. M. Desai, Mr. N. V. Kanitkar and Mr. B. B. Desai. In addition to the above Messrs. K. V. Joshi and B. P. Deshpande, in the subordinate service, were also on deputation with the Indian Central Cotton Committee.

The Director of Agriculture continued to discharge the duties of Director of the Sakrand Agricultural Research Station in addition to his own duties, while Mr. Tamhane, Senior Resident Officer, discharged the duties of officer-in-charge. This arrangement, after remaining in force for nearly three years (since October 1927), was terminated on the 1st June 1930 owing to the appointment of Mr. W. J. Jenkins, as Chief Agricultural Officer: which appointment combines the duties hitherto discharged by the Deputy Director of Agriculture in Sind and the Director of Sakrand Agricultural Research Station and carries a status higher than either as it is intended that this officer shall be independent of the Director of Agriculture, Bombay Presidency.

The post of Cotton Research Officer, referred to on page 35 of last year's report, has unfortunately not yet been filled owing to the fact that a suitable incumbent has not yet been found by the Indian Central Cotton Committee.

PUBLICATIONS

The Department has published, during the year under report, the following memoirs, bulletins and leaflets:—

Memoirs

1. Studies in Gujarat Tobaccos and their improvement by Mr. V. M. Mujumdar.

Bulletins

1. Bulletin No. 156 of 1928—Grape culture in Western India, by Mr. S. R. Gandhi.
2. Bulletin No. 160 of 1929—Soils of the Bombay Presidency, by Rao Bahadur D. L. Sahasrabuddhe.
3. Bulletin No. 161 of 1930—Cattle feeds of Western India, by Rao Bahadur D. L. Sahasrabuddhe.

Leaflets (with vernacular versions)

1. Leaflet No. 6 of 1929—Effluent as manure for sugarcane (in Marathi only).
2. Leaflet No. 7 of 1929—Preservation of seed.
3. Leaflet No. 8 of 1929—Land Leveller.
4. Leaflet No. 9 of 1929—Cultivation of Chillies.
5. Leaflet No. 10 of 1929—Effect of comparative rotations in sugarcane cultivation (in Marathi only).
6. Leaflet No. 11 of 1929—Effluent as manure for vegetables, betelvines and fodder crops (in Marathi only).
7. Leaflet No. 12 of 1929—Cultivation of onions.
8. Leaflet No. 13 of 1929—Control of the grain smut of jowar.
9. Leaflet No. 14 of 1929—Lucerne—A valuable green fodder.
10. Leaflet No. 15 of 1929—Manure for potatoes.
11. Leaflet No. 16 of 1929—Earthing up of sugarcane by the sabul plough.
12. Leaflet No. 17 of 1929—Sugarcane.
13. Leaflet No. 18 of 1929—Destruction of locusts.
14. Leaflet No. 19 of 1929—Possibilities of groundnut as a Rabi crop in the Konkan.
15. Leaflet No. 20 of 1929—Water finding machine.
16. Leaflet No. 21 of 1929—Improved sugarcane varieties for Kanara and Konkan in general.

17. Leaflet No. 22 of 1929—Undi cake as manure.

18. Leaflet No. 1 of 1930—Economy of rice seed and the proper method of raising rice seedlings in Kanara.

19. Leaflet No. 2 of 1930—Bamboo baskets *versus* wooden cases for packing mangoes.

Poona, 3rd October 1930.

T. F. MAIN,
Director of Agriculture,
Bombay Presidency.

APPENDIX "A"

LIST OF TALUKA DEVELOPMENT ASSOCIATIONS ORGANISED
UP-TO-DATE

According to the scheme laid down in Government Resolution No. 3378 dated 5th June 1922, Revenue Department, 84 Taluka Development Associations have been formed until now as shown below :—

Gujarat Division

Surat District	3
Ahmedabad District	1
Kaira District	2

Khandesh and Nasik Division

East Khandesh District	10
West Khandesh District	7
Nasik District	5

South Central Division

Poona District	3
Sholapur District	3
Satara District	10

Southern Division

Belgaum District	4
Bijapur District	2
Dharwar District	7

Konkan Division

Kanara District	2
Ratnagiri District	4
Thana District	4
Kolaba District	2

Sind Division

Hyderabad District	4
Nawabshah District	1
Larkana District	2
Sukkur District	4
Thar and Parkar District	3
Karachi District	1

Out of 84 associations 11 were formed in the year 1922-23 ; 26 (exclusive of Alibag wound up in 1927) in the year 1923-24, 10 in the year 1924-25 ; 11 in the year 1925-26 ; 15 in the year 1926-27 ; 8 in the year 1927-28 ; 1 in the year 1928-29 and 2 in the year 1929-30. Since 1928-29 new

associations are not being formed and registered as Government instructed this Department not to encourage the formation of new associations and asked to restrict the expenditure strictly within the limits of the budget provision, as long as the Provincial revenues continue to be embarrassed. However the following two associations have been formed during the year 1929-30 :—

- | | |
|--|--|
| (1) Taluka Development Association*, Mundargi Petha, Dharwar District. | Sanctioned by Government Resolution No. 3465/28 dated 2nd April 1930, Revenue Department, not registered till the end of June 1930. Subsidy not paid during 1929-30. |
| (2) Taluka Development Association*, Mahad Taluka, District Kolaba. | Allowed to be registered by the Joint Board on the condition that the Association should not expect Government subsidy. Not registered till the end of June 1930. |

Subsidies amounting to Rs. 46,350 have been granted during the year 1929-30.

The Divisional Boards of Agriculture were asked to arrange the associations in order of merit as under :—

Class—

- A. The most successful or efficient.
 - B. Struggling associations which deserve help if possible.
 - C. Moribund Associations,
- and according to this classification by the Divisional Boards, the number of associations in each class is as under :—

	Class		
	A	B	C
1. Gujarat Division	5	1	..
2. Khandesh and Nasik Division	12	8	2
3. South Central Division	7	7	2
4. Southern Division	7	3	2
5. Konkan Division	4	5	2
6. Sind Division	8	5	2
	43	29	10

* Two new associations not yet classified.

APPENDIX B

SUMMARY OF WORK DONE AT THE POONA AGRICULTURAL COLLEGE FOR THE YEAR 1929-30

This is the twenty-second year of the College.

2. Its equipment consists of two splendid buildings with class rooms, laboratories, library, museum and herbarium and a building for hostel accommodation of 120 students, a large farm of about 250 acres and a Dairy Farm to maintain about 100 animals in milk. Hostel accommodation for 50 more students has been temporarily available in the abandoned military barracks which were built on the estate in the late war.

Personnel

3. Dr. W. Burns was in charge of the College till 7th September 1929 when he was appointed acting Director of Agriculture. He proceeded on leave from 7th June 1930. During Dr. Burns' absence from the College, Rao Bahadur P. C. Patil held charge of the Principalship from 7th September 1929 to 30th April 1930 and Professor V. G. Gokhale from 1st May 1930 onwards.

All throughout the absence of Dr. W. Burns, Professor G. B. Patwardhan acted as Professor of Botany and Mr. L. B. Kulkarni as Assistant Professor of Botany.

Mr. G. K. Ranade, an old student of the parent College who was working as Assistant Professor of Agriculture for over 12 years retired on pension from 15th November 1929. Mr. K. S. Kulkarny has been appointed in his place.

Mr. H. G. Baluch who was on deputation to Sind from 6th October 1928 returned to his post of Assistant Professor of Animal Husbandry and Dairying in the college on 20th December 1929, relieving Mr. M. M. Desai.

Mr. V. G. Deshpande, Lecturer in Entomology, proceeded on two years' leave in September 1929 to take up a higher course of Entomology in Great Britain. Mr. A. K. B. Cazi who recently returned from Great Britain with the degrees of B.Sc. (Edin.), D.I.C., N.D.D., has been taken up in his place.

Examination results

4. *Final Examination for the degree of Bachelor of Agriculture, held in March 1930.*—In all 76 men appeared for this Examination and 52

passed making a total pass percentage of 80·2. The following was the distribution according to optional subjects :—

	Number appeared	Number passed
Intensive Study of crops { Cotton group ..	7	6
{ Sugarcane group.	8	6
Advanced Plant Breeding	12	8
Advanced Agricultural Chemistry	10	7
Advanced Animal Husbandry and Dairying	8	6
Advanced Agricultural Economics	17	16
Advanced Horticulture	13	11
Advanced Plant Pathology	1	1
	76	61

5. *Part Examination at the end of the second year.*—Of the 50 students who took the part examination in Botany and Plant Pathology at the end of their second year, 42 passed in two subjects, 8 passed in one subject and none failed in both.

6. *Intermediate Examination.*—In all 83 appeared. Of these, 69 passed, 7 being placed in the first class. This gives a pass percentage of 83.1.

Comparison with the previous Results.—During the last triennium the passing percentages are as follows :—

			1928	1929	1930
B.Ag. Examination	..	..	50.6	75.9	80.2
I.Ag. Examination	..	..	73.7	69.2	83.1

7. *College Diploma Examinations.*—Three students appeared for the final examination of the College Diploma ; of these, one passed securing very high marks. Three Diploma students appeared for the part examination at the end of the second year and all passed in both subjects. Four students appeared for the Intermediate Examination for the Diploma and all passed.

8. *Short (one year) Course.*—Ten students took this course. Of these 6 passed the test held at the end of the year.

9. *Special courses.*—The following special courses were given during the year :—

Kind of course	Number of students	Period of course	Name of section by which given
Mali class ..	6	10 months	Horticulture.
Irrigation Officers' Training class..	15	2 days	Agriculture.
Practical Farm Management ..	1	2 months	Agriculture.
Practical management in Animal Husbandry and Dairying.	1	6 weeks	Dairy.

10. *Master's degree in Agriculture.*—Four B.Ags. who were working under the Professors of this College for their Master's degree in Agriculture submitted their theses in December 1929; of these, two have passed.

Admissions for 1930-31

11. The number of candidates who applied for admission, those who have been actually admitted and those who were present in the College on June 30 (i.e. 20 days after the start of the new session) are given below :—

Origin	Object	Applied	Admitted	Arrived
Bombay Presidency, its Native States and Sind.	Degree	121*	97	79
	Diploma	1	..	..
	Short course	14	9	9
Other parts of India	Degree	43	10	9
	Diploma	4	..	..
	Short course	6	2	2
Total ..		189	118	99

As in the past, a large number of students who are admitted fail to join the college. A certain number of those, who join, leave the college without notice. Some candidates come up for admission in person after the College has opened. The Principal's task of admitting men therefore becomes complicated and difficult as he does not know till about the end of June whether all vacancies available have been filled or not. Judgment has therefore to be based on the averages of the past.

The large demand for admission from students outside the Bombay Presidency continues. Such admissions are however limited to 10 per

* One of these students being a B.Sc. with Botany and Chemistry is directly admitted in the junior B.Ag. class, as allowed by the University Regulations.

cent. of the total admission and hence it is not possible to meet the full demand.

12. *Admissions for M.Ag. work.*—Five B.Ags. are working under the Professors of this College for their M.Ag. work and one B.Sc. for his M.Sc. work.

Scholarships for 1930-31

13. Of the fifteen, three-year Government scholarships of the value of Rs. 15 a month to be annually awarded in the presidency proper, the following is the distribution by castes for the year 1930-31. Broach Patidar 1; Lewa Patidar of Khandesh 1; Lingayats 2; Dhanagar 1; Raddi 2; Goud Saraswat Brahmin 1; Havik 1; Ful-Mali 1; Maratha 3. (This includes one four-year scholar); Nagar Brahmin 1; Jain 1.

Out of the 6 Sind Scholarships, 3 have been awarded to Hindus, 1 to Sikh and 2 to Mohamedans.

Hostel Accommodation

14. The total number of students accommodated in the hostel is 177 this year, filling up all possible accommodation in the college hostel as well as in the barrack which is fast reaching its danger point. About 40 students had to be told to make their own arrangements elsewhere. The necessity for additional hostel accommodation has assumed a great urgency and it is hoped that the proposals for the construction of a new hostel block which were already submitted to Government may soon be sanctioned.

Careers of Graduates

15. It is too early to say about the careers obtained by graduates of March 1930. Out of those passed up to the year 1929, the following numbers have found employments during the year under report in the different occupations :—

Private farming	..	..	7	
Bombay Agricultural Department	..	..	2	
Other Provincial Government Agricultural Departments	..	..	4	
Bombay Police Department	..	..	1	
Indian States Service	..	..	3	
Sassoon David Trust Fund	..	..	2	
Chilean Nitrate Syndicate	..	..	1	
Imperial Chemical Industries, Limited	..	..	1	
Other Private Institutions connected with Agriculture	..	..	3	
Science Teaching	..	..	1	
Fruit Broking	..	..	1	
Department of Criminal Tribes Settlement	..	..	1	
Unemployed	..	..	10	—Of this number 2 have proceeded to England for post-graduate studies.
Unknown	..	..	24	

Library

16. During the year, 270 volumes were added to the Library. The total number of books in the Library apart from periodicals is now 7,515.

Athletics and Social Activities

17. *The U. T. C. Platoon* under Second Lieutenant K. S. Kulkarny (now a full King's Commission Officer) was full and went in camp before X'mas. The Rover scouts under Mr. A. A. Vasavada numbered over 40 as against 32 in the previous year. They had a camping programme near the Loni Agricultural school during X'mas. They put up a fine display at the time of their third annual camp fire held in February last.

18. *In the Inter-collegiate sports* the College carried off two cups (1) Sir Leslie Wilson Gymnastics Championship Cup ; (2) The Hiremath Cup for fast walking.

19. *College Gymkhana*.—The standard and efficiency of the College Gymkhana continued to be hampered by the handicaps placed by the continuance of the barracks on the play-ground and insufficiency of funds. The students were not however wanting in effort to do their best under the circumstances.

20. *Social gathering*.—The annual social gathering of students and staff was celebrated as usual on the 2nd of August 1929 when His Excellency the Right Hon'ble Sir Frederick Hugh Sykes, P.C., G.C.I.E., G.B.E., etc., Governor of Bombay, obliged us with an address and distribution of prizes. Many other distinguished guests also honoured us on the occasion.

Veterinary Hospital

21. The number of in and out-patients treated during the year was 437 and 4,606 respectively, which does not materially differ from those of the previous year.

The renovation of the Hospital from the very generous donation of Rs. 30,000 given by Bai Sakarbai Nusservanji Anklesaria was completed by the end of January 1930. The opening ceremony of the new buildings was performed on the 8th February 1930 by Mr. J. Ghosal, I.C.S., C.S.I., C.I.E., the then Commissioner of the Central Division under its new name "Nusserwanji Sorabji Veterinary Hospital."

Research and Advice

22. All the staff mentioned in the beginning of this report have carried on Research and Advice in the time which was available after satisfying the needs of teaching and administration of their respective sections. Summaries of such Research and Advisory work are embodied in the reports of the respective heads of sections which are appended to the Annual Report of the Department.

Visitors

23. Amongst the distinguished visitors during the year, the College had the honour of a visit from His Excellency the Governor during the first week of July 1929. His Excellency was shown round the farm and Laboratories and took a keen interest in the college activities.

From amongst the ruling princes of native states we had the honour of a visit from His Highness the Maharajasaheb of Bhavnagar accompanied by Sir Prabhashankar Pattani and party, and His Highness the Nawabsaheb of Cambay accompanied by Major Harrison.

Amongst other visitors were Mr. Henry of Imperial Chemical Industries, Ltd., Mr. Cliff, Deputy Director of Agriculture, Bihar, and Dr. Butterfield, Messrs. J. J. Dealois and B. G. Case of America.

College of Agriculture, Poona :
August 1, 1930.

V. G. GOKHALE,
Acting Principal,
College of Agriculture, Poona.

APPENDIX C

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, NORTH CENTRAL DIVISION, NASIK,
FOR THE YEAR 1929-30

Staff and Organisation

I remained in charge of the Division throughout the year under report. Mr. R. M. Choudhari, B.Ag., was transferred as Demonstrator in the College of Agriculture, Poona, and Mr. D. M. Kulkarni, B.Ag., from Konkan Division was sent to this division in his place. Mr. S. K. Ghorpade, B.Ag., has gone in foreign service and Mr. S. S. Surve, B.Ag., has taken his place as Head Master, Agricultural School, Dhulia. The demand from the public for advice is increasing and the staff is meeting it with great difficulty. The necessity of a graduate to deal with the questions of plant pests and diseases is keenly felt. The work on the Jalgaon Farm has increased and to cope with it one more graduate is necessary for the Farm.

The Annual Staff Conference was held at Dhulia on 2nd May 1930 which was attended by all officers except the Manager, Sangvi Cattle Breeding Farm. The work done during the year was summarised by the Chairman—the Deputy Director of Agriculture—and was fully discussed. After discussion, annual programme drawn up by the Chairman was approved with slight modifications. The difficulties of the staff were considered and some solutions were suggested. It was pointed out that the propaganda work was very much hindered on account of limited grant under travelling allowances.

Season

The anti-monsoon showers in January and February, though small in quantity, were very useful for preparatory tillage. The season broke out by the middle of June and rains were sufficient to start sowing in time. Till 15th of July rains were abundant and there were good signs of a normal season. But the situation changed afterwards and there were practically no showers of utility for nearly two months. The long break had a very bad effect on the kharif crops, effect being on the growth of all crops. Groundnut suffered most, and the fodder supply became short on account of stunted growth of jowar and bajri. September rains saved the situation to a certain extent, but they too were found insufficient. Later on there were no showers and hence rabi season proved a failure.

Special features of the season are summarised below :—

(1) There were anti-monsoon showers in January and February in most of the talukas, which were found useful for preparatory tillage.

(2) Regular monsoon started by the middle of June and rain was sufficient to start kharif sowings in time.

(3) Heavy rains affected the germination of cotton in some places and the area to the extent of 5 to 6 per cent. had to be resown. Till the 15th of July rain was more than normal which prevented inter-culturing and weeding operations. Weeding expenses were, therefore, rather heavy.

(4) There were practically no useful showers till the second week of September, which affected the growth of kharif crops.

(5) Light showers in the third week of September helped the kharif crops to a certain extent and the conditions seemed to be hopeful for a good rabi season. October rains were also deficient and rabi sowings, to keep in time, had to be done with insufficient moisture in the soil.

(6) There was no dew fall which is helpful for rabi crops.

(7) Cold wave damaged rabi and garden crops in two talukas of the Nasik District.

(8) In short the distribution was most uneven giving most of the average rain by the 15th of July, then a long break of two months and later on very scanty rains in the beginning of rabi season. All these had a bad effect on the crops which were below normal.

Plant Pests and Diseases.—Due to continuous cloudy weather, cotton and garden crops were attacked by aphids. The damage from wingless grasshoppers was not so severe in the Nasik District as in the previous years, but a big swarm of locusts passed through four talukas of East Khandesh, one of West Khandesh and three of Nasik districts. These locusts damaged jowar, wheat, linseed, tur and cotton crops in different degrees in the area. Jowar was also attacked by stem-borer.

Attack of cotton wilt was rather serious this year, especially in fields growing cotton, year after year continuously. Wheat was not attacked by rust this year.

Research and Experimental Work

Improvement of cotton.—The work of the Cotton Breeder, to find out a better strain for Khandesh tract, was continued on the lines described in the previous reports.

This was the third year in which rigid yield tests of Dhulia 1, now known as Banilla, were made to obtain significant yield data. The trials arranged were as under :—

(1) Strip tests on the Dhulia School Farm.

(2) Field scale tests on the Jalgaon Farm (yield of 5-guntha plots replicated eight times so as to give one acre of each variety).

(3) Large observation plots on the Jalgaon Farm.

The strip and half drill strip trials did not show superiority of N.R. over Banilla. In 5-guntha replicate tests and in one large observation plot N.R. has shown superiority over Banilla, whereas in other two observation plots Banilla has done better than N.R.

In ginning percentage Banilla has maintained its superiority by 3 per cent. The premium obtained for this cotton ranged from Rs. 22 to Rs. 36 over that of N.R. per candy of 784 lbs. lint. The premium offered for seed cotton (kapas) was Rs. 4 over that of N.R. per maund of 84 lbs.

The general opinion of the Director, Technological Laboratory, Matunga, about Banilla cotton is as under :—

“ Besides differences due to differences in places of growth, there are differences due to seasonal effect, thus Jalgaon cotton was suitable for 18½'s counts in 1926-27, 21's counts in 1927-28, 19's counts in 1928-29, but only 15's counts in 1929-30. Dhulia samples show a somewhat similar variation. Everywhere in 1929-30 the results are poor; but from the known susceptibility of Banilla cotton to the effect of district of growth, and the fact that climatic conditions were unusual and unfavourable during 1929-30, it is possible that the poor results in the season are merely temporary and due to unusual conditions of growth. At the same time it may be noted that the local Khandesh (N.R.) cotton, tested as a control sample during the various seasons shows much less variation, though even in 1929-30 its performance is much inferior to that of banilla in any district.”

Isolation of high yielding and high ginning strains in roseum.—The six strains isolated were taken for trial. N.R. 144 has given indications of high yield during the year under report, but its ginning is only 35 per cent. Strain No. 6 which was found superior last year, which gins 39 to 40 per cent., was found susceptible to wilt. So far, the only promising strain is U. 19, as it combines in it, yield, ginning (39 per cent.) and resistance to wilt. Its trial in strip tests for a couple of years more will very largely solve the problem.

Study of Hybrids.—The study of crosses in F1 generation and F3 generation was continued and it has been observed that it is possible to get useful strain for Khandesh from the cross of Dhulia 2 × Comilla. The study of the crosses reported last year was continued.

Root Study of Cotton.—This work was taken up and continued for three years and the results can be summarised as under :—

(a) The period of greatest root activity is generally associated with that of intensive flowering.

(b) The stem growth is proportionally less in the beginning but after about the eighth or ninth week it grows very quickly, its activity also coinciding with that of intensive flowering and greatest root activity.

(c) The yield is very greatly correlated with the production of a large number of laterals near the base of the tap, as well as the expanse of these laterals.

Experimental Station Work

Jalgaon Farm.—The work of producing first class seed of cotton as well as of investigation was continued. Experimental work had to be continued on this farm, though a seed farm, as there is no other farm in this division where experiments could be arranged. The experimental work is increasing and to cope with it another graduate is necessary on the Farm.

During the year under report average yields obtained were as under:-

Crop	Area	Yield
Cotton ..	130 acres and $19\frac{1}{2}$ gunthas.	N.R. 719 lbs. per acre; Banilla 619 lbs. per acre.
Groundnut ..	14 acres and 11 gunthas ..	1232 lbs. of dry pods per acre.
Jowar and uidid..	18 acres and $15\frac{1}{2}$ gunthas ..	Jowar grain 559 lbs. per acre ; Udid grain 142 lbs. per acre.
Wheat ..	16 acres and $20\frac{1}{2}$ gunthas ..	144 lbs. per acre.
Gram ..	1 acre ..	417 lbs. per acre.

The long break of over two months after 15th of July had a very bad effect on the crops and hence the outturns are below the average yield of the Farm, but are more than those obtained by cultivators in the district. The crops which suffered most were wheat and jowar. It has already been pointed out under the heading "season" that the rabi season was a complete failure in the tract. In spite of the peculiar season, the yield of cotton and groundnut is very good and that of jowar and wheat, though not as good as that obtained on the Farm in previous years, is satisfactory when compared with that obtained in the district or in the vicinity of the Farm. All this is due to proper and timely handling of soil. Many people had to abandon sowing of wheat round about the farm as there was no moisture even for germination.

The experiments on manuring of cotton, groundnut and wheat were continued and the results are included in the report of experimental work on the farm.

During the year, following implements were tried :-

Avery's cotton planter for sowing cotton.

Mr. Schutte's drill for sowing cotton and jowar.

Potato digger as modified by the Agricultural Engineer for uprooting groundnut.

All these implements require improvements and suggestions were given to make them suit the local conditions.

Seed distribution.—The quantity of seed distributed was as under :-

N.R.	..	..	18,000 lbs.
Banilla	..	..	9,000 lbs.
Groundnut	..	..	16,348 lbs. pods.
Do.	..	..	2,434 lbs. kernels.
Jowar	..	..	3,273 lbs.
Wheat	..	..	1,560 lbs.

Implement Dépôt.—The dépôt kept on the farm is popular in the locality. Implements of different make, as well as spare parts are supplied to cultivators from this dépôt. Twenty-eight Wiard ploughs and spare parts worth Rs. 500 nearly were sold during the year.

Nursery.—As described in the last year's report, this work is continued in two centres, namely at Dhulia and at Khed. Due to peculiar season and subsequent heat no budding could be done in these nurseries though 3,700 jambori plants were ready for budding.

In the district the Horticultural Overseer grafted 99 mango plants, budded 40 lemon and 177 bor plants. Besides this he demonstrated pruning of citrus plants, mangoes, guavas, etc. He works as instructor at the Dhulia Agricultural School in horticultural lessons.

Belgaon Plot.—The superiority of Kusali (awned) bajri over Akola bajri in transition tract was again corroborated from the results obtained this year.

Work on onion manuring as well as on wheat was continued. The results on onion manuring are again in favour of 200 lbs. of nitrate of soda per acre.

Cattle Breeding Farm, Sangoi.—This is the third year since it was taken over from the Shirpur Association. The herd on the Farm is Tapti Khillari. There are no quarters on the Farm for the staff but it is expected to get the quarters built during the year 1930-31. The walls of the cattle yard are all of mud and expenditure on repairs is comparatively heavy. There is a great necessity for a shed to store fodder which otherwise is spoiled by rain.

Jowar and maize was grown for fodder on nearly 17 acres which is brought newly under cultivation. Nearly 5,000 lbs. of jowar fodder and maize was filled in the silo together with green grass, total quantity filled being nearly 38,000 lbs. This quantity of silage was sufficient for three months. The rest of jowar fodder was fed as kadbi. This fodder is found useful to keep cattle in good condition.

The total number of cattle on the farm was 86 as against 75 of the previous year. The stock now consists of:—

Cows	..	..	..	..	42
Female calves of different ages	..	..	..	..	15
Male calves of different ages	..	..	..	..	26
Breeding bull	..	..	..	..	1
Work bullocks	..	..	..	..	2
Total					86

During the year under report 24 cows were covered, of which 14 calved, 2 aborted and the rest came in heat again. Amongst new calves 9 are female and 5 are male calves.

The condition of cattle during the year was fair. The deaths on the Farm were five—one cow, two female calves and two male calves. Though there was an outbreak of epidemic in the vicinity which played a serious havoc in the cattle of the villages we could prevent it by timely inoculation of our cattle. Owing to night vigilance there were no kills by panther in the cattle yard.

Four breeding bulls were sold on premium system and the amount realised (half the cost) was credited into Shirpur sub-treasury.

Mr. More remained in charge of the Farm for nine months and went on leave for three months, when Mr. Nikam acted for him. Mr. More is a good manager and knows handling of cattle. He has done a very good work to improve the farm and tame the cattle.

Work in the District

This work cannot be described in all details owing to limited space and hence it is given in a very concise form. The work consist of :—

(1) Distribution of seed, implements and manures.

(2) Popularising the recommendations of the Department, such as wider planting, manuring and earthing up of sugarcane, Pusa wheats, use of castor cake and groundnut cake mixture for cotton, use of sulphate of ammonia for rice seed-beds and nitrate of soda for onions, storing of farm yard manure, siloes, etc.

(3) Arranging trial plots in the district to verify results under different conditions.

(4) Trial of manures.

(5) Trial of wheat and cotton strains.

(6) Attending to enquiries.

Necessary help of Taluka Development Associations was taken to carry out this work, in the district where available and of individuals as well as, officers of other departments where such Associations do not exist.

WORK OF DISTRIBUTION OF IMPROVED TYPES OF SEEDS, IMPLEMENTS AND MANURES

Distribution of Seeds

Cotton.—This year more attention was paid to the purification of Banilla cotton and its seed distribution. Before giving the details, it will not be out of place to trace the history of this cotton.

This strain is a selection from the original material B XX. From the progeny of this material, plant No. 27 was selected in the year 1921, as one of the promising plants. Though its genetic constitution was not pure in the beginning, the name B XX 27 was continued for several years. But it was soon noticed that the name B XX 27 was found unintelligible to the cultivators and so it was named as Dhulia No. 1 in the year 1927 ; but as this cotton though superior to "Oomra" cotton in quality of staple, did not realise its full market value merely because it came from Khandesh, a tract so well known for its short staple, it was considered desirable to change its name. Accordingly, the name "Dhulia 1" was changed to "Banilla" in the year 1929. This name truly signifies its origin from the hybrids of Bani and Comilla and may represent the combination of the desirable quality of its parents.

Seeds of Banilla, N.R., and 1027ALF were distributed.

Banilla cotton is getting popular both amongst the growers and amongst traders and the area under this cotton is fast increasing which will be seen from the following figures :—

Year	Area in acres
1926-27	50
1927-28	500
1928-29	3,000
1929-30	30,000
1930-31	100,000 nearly. (This is the estimated figure from seed available for distribution.)

Seed distribution in concentrated areas has proved a success. 7,050 lbs. of seed received from the Jalgaon Farm was issued to nine Taluka Development Associations which was grown on an area of 350 acres. All this area was purified and the cotton ginned and sold under the supervision of departmental staff; half the quantity of seed, namely 32,240 lbs., was purchased for further distribution. This quantity of seed will be sufficient to grow an area of 2,000 acres while an equal area will be covered by the quantity which remained with the growers. This will be the main source for further multiplication of seed and will be managed under the supervision of the departmental staff.

In addition to the Farm seed 197,270 lbs. of Banilla seed collected from second and third generations in the district, was distributed in seven talukas, namely, Amalner, Pachora, Chalisgaon, Jalgaon, Raver, Bhusawal and Chopada of East Khandesh District. The estimated area under this cotton was nearly 30,000 acres during the year 1929-30. In order to get good premium, purity must be maintained since merchants pay Rs. 6 to Rs. 10 less per bale for non-purified cotton. This fact was brought to the notice of growers by issuing leaflets and by giving lectures. It was not possible to control the whole area as the staff is limited. The growers were therefore requested to get their crop purified on contract work at annas 4 per acre. Nearly 800 acres were purified on contract basis. The total area purified excluding the above 800 acres, in different talukas was 8,000 acres. Purification has to be done three times.

Yield of Banilla in the district.—The yield varied according to season, soil, rotation and treatment. Approximate idea can be had from the statement A given in the appendix. The statement also shows ginning percentage and prices obtained which were Rs. 20 to Rs. 30 candy over local cotton.

Three years' trials of banilla on a large scale in the district show that if there is any decrease in the yield of kapas than N.R. it is made up in ginning percentage and the extra price obtained on account of quality is the net profit in favour of Banilla which is estimated at

Rs. 4 per acre at least. This will be seen from the statement given below :—

Year	Crop	Area in acres	Yield per acre in lbs.	Ginning percentage	Value obtained per boja of 392 lbs.	Value obtained per acre	Difference in favour of (+) or against (-) Banilla.
					Rs. a. p.	Rs. a. p.	Rs. a. p.
1927-28	N.R.	..	543	35.4	Banilla lint fetched a premium of Rs. 4 per paila of 240 lbs. over that of N.R.	..	+4 13 0
1927-28	Banilla	25	488	39.5			
1928-29	N.R.	..	442	35.0	126 0 0	58 2 0	..
1928-29	Banilla	518	438	40.5	135 4 0	60 3 0	+7 1 0
1929-30	N.R.	55	460	35.0	110 0 0	47 7 0	..
1929-30	Banilla	84	435	39.4	125 0 0	58 14 0	+6 7 0

The peculiarity of this year is that there is a fall in counts which seems mainly due to season. The drop in counts is also noticed in N.R. The drop in counts will be a subject for further study which will be taken up, to find out whether it was due to season or something else.

Seed supplied for the year 1930-31 is as under :—

	Lbs.
(1) Jalgaon Farm seed	9,000
(2) Seed collected from second and third generation in the district	504,464

Banilla has maintained its higher ginning and it has been observed that it resists wilt better than N.R. Regular observation plots will be arranged during the current season.

The opinion of local mill agents and purchasers is in favour of its extension since they find it superior to the local cotton. Copies of their opinion have been given in Appendix B.

N.R. seed distribution.—About 10,000 lbs. of N.R. seed received from Jalgaon Farm was issued to several Taluka Development Associations, which was grown over an area of 500 acres. The purification and ginning was managed by the Associations and they have collected 87,993 lbs. of seed for distribution. Nearly 30,000 lbs. of this seed was supplied to people outside this division.

During the year 1930-31, 18,600 lbs. of N.R. seed received from the Jalgaon has been issued to Taluka Development Associations in this Division and to officers and farms on Deccan Canals.

Extension of 1027 A.L.F.—Navapur and part of Nandurbar talukas have conditions akin to Surat tract and hence arrangements were made to supply 2,000 lbs. of pure seed. Arrangements are also made for its further extension. Merchants supply the same seed to their tenants and the area is thus increasing under this cotton.

Extension of Akola bajri, Pusa wheat and wheat strains of the Crop Botanist.—The value of Akola bajri has been appreciated and a regular demand for its seed has been created. It now remains only to organise the seed supply. Every year the demand for this seed is increasing and it is found to difficult to cope with the work with the present staff. There seems to be a necessity for a breeding station in the locality, which, if started, will be of immense good to cultivators.

Wheat strain No. 162 and No. 168 are getting popular in Trans-Tapti section and arrangements will be made to organise their seed supply. As regards Pusa 4, wheat, arrangements were made to supply pure seed from Pusa to two Taluka Development Associations, which will form the nucleus of the extension of Pusa wheat. Most of the growers of irrigated wheat prefer it since it is not easily affected by rust. Demand for this seed is increasing. Most of this work, namely of distribution of seed, has been handed over to the Taluka Development Associations and they are doing very good work under the direction of the officers of the Agricultural Department.

Trials done in the District

Trials done in the district during the year under report are given below crop by crop :—

Cotton.—The results of manuring obtained during the year..... though show an increase in yield are found uneconomic, due to failure of season and fall in cotton prices. If the prices remain as low as those of this year, then these manures will be found uneconomic. Trials of Banilla in new tract show that it is in no way inferior to N.R.

Bajri.—Trials of Akola bajri confirm the results of previous years, that it gives better yield than the local variety in all places and needs no more trial. The demand for this seed is fast increasing. Trials seem necessary to find out how long it maintains its superiority and after how many years the seed should be replaced.

Cultural plots show that a distance of 12" gives better yield than 9" or 10".

Awne bajri trials in transition tract reveal that it is better than Akola bajri and may suit the tract. The trials were continued for five years and the results of all years are confirmative.

Jowar.—The work on Shalu jowar was continued in Shahada Taluka. It has been noticed that both the varieties, namely Dagadi from Ahmednagar and Maldandi from Sholapur are better yielders and the area under these varieties is increasing.

Comparative trials with sulphur treatment, remedy against smut of jowar, were arranged and it has been noticed that the remedy is equally good, while it is cheaper and easier than steeping in copper sulphate solution.

Wheat.—Four rust resistant strains from the Crop Botanist were tried in Nasik District, but this year no rust appeared and nothing therefore can be said about the rust resisting quality. Trials will be continued.

Work on manuring was not taken up this year as there was not sufficient moisture in the soil. It will be taken up next year if the season is favourable.

Planking of wheat after three weeks after sowing has given better results.

Sugarcane.—J-133 is getting popular and the area under this crop is increasing in Nasik District.

Wide planting of cane, planted 3' to 3½' apart, is taken up by many people in Nasik District and in Sakri Taluka of West Khandesh District. Sulphate of ammonia as a top dressing manure has become popular and is now used on a larger scale.

Rice.—The results show that seed of Kolamba No. 42 deteriorates after two years and comes to the level of local Kolpi variety. But though the yield is equal, the quality is good and cultivators get from Re. 1 to Rs. 2 more per acre.

Strain No. 79 is early and the area under it is extending.

The seed rate in Sakri Taluka has been reduced and many cultivators have taken to 40 lbs. of seed rate per acre.

Chillies.—The results obtained from manurial trials are not conclusive and the manures need further trial.

Garlic.—Further trials with nitrate of soda and sulphate of ammonia in doses of 200 lbs. and 240 lbs. respectively show that nitrate of soda is a better manure for garlic.

Onion.—Trials were arranged with sulphate of ammonia and nitrate of soda of equal value per acre. The results are not conclusive.

Nagli.—This crop forms one of the important crops and arrangements were made to supply better seed. The results are not conclusive and need further trials.

Mowra refuse as manure.—There was a large quantity of this refuse in the Government Distillery near the Nasik Road Station, which was not used. Experiments were laid with several crops, namely sugarcane, onion, wheat and vegetables in the locality and were continued for three years successively. The results were in all cases in favour of this manure, which were demonstrated to the people. The trials were compared with farm yard manure in equal quantity. The cultivators especially those from Sukene and other villages in Niphad Taluka have appreciated the value and 12,000 carts have been sold upto now from the stock of 24,000 cartloads. It is expected that the people from surrounding villages will use it from next year.

Miscellaneous

Agricultural work in Bhil tract.—The work of demonstrating iron ploughs, use of steeping jowar in copper sulphate as a preventive against jowar smut, use of selected seed and preservation of farm yard manure was successfully carried out. As a result of these, 10 cultivators from five villages used the iron plough, steeped 416 lbs. of jowar seed,

8 manure pits were dug and 485 packets of copper sulphate were issued and 1,000 lbs. of 1027 A.L.F. cotton, 400 lbs. of N.R. and 800 lbs. of san seed for green manuring were distributed. In addition demonstration plots under san for green manuring, Akola bajri and sugarcane were laid out in ten villages.

Agricultural work in Dangs.—A special Kamgar is posted at Ahwa who works under direct supervision of the Divan of Dangs. A programme is drawn up for him and he works it up. The Deputy Director visited the tract and gave necessary instructions to the Kamgar and suggested few new lines of work to the Assistant Political Agent. The work done by the Kamgar is summarised below : —

1. Constructed 95 embankments for rice fields (rice is grown in flat beds and the yield is low).
2. Proper time for hay making and preservation of the same was demonstrated in 10 places.
3. Demonstrated filling of grass in katcha silos at two places.
4. Arranged for demonstration plots of nagli, groundnut, mug, as well as vegetables.
5. Carried successfully the rat killing campaign which is a serious trouble.

The work of this Kamgar is found very useful in the tract.

Power chaff-cutter.—The demonstration of the working of power chaff-cutter was given in eight villages of Jalgaon and Bhusawal taluka and nearly 9,400 bundles of kadbi were chaffed. The season was very short as the supply of kadbi was very short. The work has been appreciated and there is a keen demand for it on hire. At present a nominal charge of annas 2 per 100 bundles is charged in addition to the fuel and labour charges. The amount realised as hire was Rs. 11.

Trial of hay rake for collection of cotton stalks after harrowing and jowar stubbles shows it to be economic. With one pair of bullocks and one man it can work up to 12 acres in 8 hours. It saves 6 annas per acre over the local system of collecting with manual labour.

Taluka Development Associations

There are 22 Taluka Development Associations and all of them are doing very useful work. All the propaganda work in this tract is managed by most of them with the help of the officers of the Agricultural Department. The Associations named below did good work in the extension of Banilla cotton :

- (1) Raver, (2) Bhusaval, (3) Jalgaon, (4) Pachora, (5) Amalner, (6) Chalisgaon.

Though the Jamner Agricultural Association is not registered, it is doing good propaganda work and is managing one cattle breeding farm at Gangapuri.

Detailed information about the financial position, membership, etc., can be obtained from the statement given below :—

Statement showing information about the Taluka Development Associations in the North Central Division, (amounts collected and main items of expenditure), for the year 1929-30

Name of Taluka Development Association.	Balance plus amount collected	Government Subsidy	Amounts spent					No. of Fields arranged	No. of Demonstrations held
			Establishment and Office	Implements, etc	Manures, Seeds, etc	Demonstrations	Other charges		
1	2	3	4	5	6	7	8	9	10
<i>Nasik District</i>	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1. Nasik ..	2,006	808	907	208	37	3	436	25	7
2. Kadwa Canal ..	3,854	650	630	24	39	73	533	32	17
3. Satana ..	1,910	597	700	397	165	13	329	25	5
4. Malegaon ..	4,682	363	535	140	..	153	231	44	6
5. Yeola ..	4,893	1,000	808	1,007	..	6	945	27	2
<i>West Khandesh</i>									
6. Dhulla ..	12,698	1,000	2,449	310	819	4	2,252	..	3
7. Sakri ..	7,911	1,000	653	777	186	140	1,412	76	46
8. Sindkheda ..	2,356	949	324	40	48	31	744	23	33
9. Shahada ..	7,083	700	639	81	50	34	194	170	25
10. Taloda ..	4,084	622	643	167	399	54	917	40	48
11. Nandurbar ..	3,975	728	354	..	420	253	3,234	45	16
12. Shrirpur ..	1,673	717	357	354	263	411	278	40	50
<i>East Khandesh</i>									
13. Jalgaon ..	26,905	1,000	3,020	481	14,265	459	8,559	115	80
14. Bhusawal ..	19,715	1,000	1,461	315	2,115	263	12,047	50	46
15. Raver ..	10,703	1,000	1,891	362	263	10	3,231	116	53
16. Yawal ..	5,534	503	502	55	786	34	301	24	77
17. Edlabad ..	5,842	569	463	130	426	102	890	29	71
18. Chopada ..	7,850	911	548	160	1,065	93	2,441	19	30
19. Erandol ..	8,013	758	593	217	652	104	2,233	15	7
20. Amalner ..	3,800	388	463	163	105	7	175	23	36
21. Chalisgaon ..	7,578	879	717	510	228	..	1,163	..	12
22. Pachora ..	1,321	1,407	2,430	262	252	..	496	40	10

All these Associations have engaged trained fieldmen, varying from one to three according to their finances and activities. Some of these

Associations have taken up the work of attending to the grievances of cultivators and getting them redressed through proper authorities. The supervision of co-operative credit societies taken up by the Dhulia, Jalgaon and Pachora Taluka Development Associations is carried to the satisfaction of the authorities concerned, and with less cost. Improvement of cattle is being done by distributing premium bulls by the Bhusawal, Jalgaon, Pachora, Chalisgaon, Dhulia and Shirpur Associations. The scheme of running a cattle breeding farm by the Jalgaon Association is held up and it is expected that some solution will be arrived at during the current year. The Bhusawal Association is constructing a building for office, etc., at a cost of Rs. 4,000 and it is expected that the Raver Association will follow the example soon.

During the year under report a conference of all the Taluka Development Associations in this division was held under the auspices of the Dhulia Taluka Development Association which was presided over by Mr. K. M. Pawar, B.Ag., Deputy Director of Agriculture, N. C. D. Most of the Associations had sent their representatives and questions about the working, subsidy, etc., were discussed. It was a successful conference.

During the year under report, the Honourable Mr. B. V. Jadhav, M.A., LL.B., Minister of Agriculture, visited many of these Associations and carefully went through their work. After going over the work he expressed his satisfaction and said that these Associations are doing very efficient work and are really very useful bodies in the spread of agricultural propaganda. It is expected that the difficulties put before him by the representatives of these Associations will receive proper consideration.

Looking to the successful management of supervision work of co-operative credit societies done by these bodies, it should be handed over to these Associations, particularly to those who come forward. This question needs favourable consideration from the authorities concerned.

Non-credit Co-operation

During the year under report a new type of society to protect crops from thieves and plunderers was organised and registered at Nashirabad in Jalgaon Taluka. There is a great trouble in the village to cultivators whose crops and grass on bandhs is either stolen or destroyed by letting in cattle or by setting fire in the threshing yard or in fields after stacking. To remove this trouble this society was organised and a cess of annas 5 per acre is collected, area being 10,068 acres. The protection of crops is arranged by employing 28 watchmen in full season to watch the crop on the whole area which is divided in two sections, each under the supervision of 13 watchmen and a mukadam. In slack season the number of watchmen is reduced. For watching the crops in the threshing yards an additional charge of Rs. 1-8-0 per pair of bullocks is collected. The work is much appreciated by the members and the subscription is collected without any difficulty.

The sale society at Jalgaon has done very good work. Agricultural produce worth Rs. 338,563-8-6 was sold and a commission of Rs. 3,800-2-0 was obtained during the year under report.

The work of Dhadne Fencing Society is not yet complete but it is expected that it will be completed during the current year.

The work of the Onion Sale Society was slack. During the year under report that sale society handled 2,480 bags as against 4,400 in last year. The gross income was Rs. 310-7-3 as against the expenditure of Rs. 320.

The Implement Society at Dabhadi has made good progress and has created a good demand for improved implements. The hire obtained for implements was Rs. 315-12-0. It has supplied seed and manure worth Rs. 5,266-1-0. Some of this was supplied on credit. The seed Society at Narayangaon has supplied seed to members worth Rs. 1,200.

Demonstration work

During the year under report two district shows, namely, one at Pachora and the other at Nasik were organised and crops were grown in crop courts. But owing to defective season the Managing Committee at both the places resolved to postpone the shows. Hence only crop demonstrations were arranged which were attended by cultivators of the talukas only.

Besides these two district shows, following demonstrations were organised :—

Serial No.	Kind of demonstration	Number	Attendance
1	Crop demonstrations ..	66	Over 4,000
2	Implement demonstrations ..	65	4,500
3	Power chaff-cutter demonstrations	14	350
4	Silo demonstrations ..	15	Over 800
5	Demonstrations of boiling of cane juice on Poona furnace ..	2	200
6	Demonstrations of steeping of jowar in copper sulphate solution.	330	6,000
7	General demonstrations at the time of Jamabandi ..	25	2,500

In addition to these, the Taluka Development Associations had arranged crop and implement demonstrations in their own localities. If the result of these demonstrations is to be judged from the following of people, it can be said that most of these proved useful as the demand for seeds of Banilla cotton, Akola bajri, Pusa wheat, J-133 of sugarcane and iron ploughs has much increased. The use of sulphate of ammonia and nitrate of soda and cakes also is on the increase. Silo demonstrations were most successful and it is expected that the number will increase from 15 to 20 this year if the season is good.

Implement Depots.—The number of depots remained the same, namely, ten and all these are in areas outside the jurisdiction of the Taluka Development Associations. The Associations maintained their own depots. The hire realised during the year was Rs. 1,143-3-9. The realisation of good hire even in bad year speaks about the popularity of these depots. These depots serve a good center for people to consult agricultural officers as well as for getting seed, manure, spare parts and implements.

Crop protection.—The trouble from wingless grass-hoppers continued in Chandor and other talukas of the Nasik district and this year an area of early 300 acres was taken on the bordering line of the affected and non-affected villages. The organisation and working was the same as reported in the last year's report, and we could show to the people that infection can be prevented by the use of tins. These demonstrations were arranged to show the working and as a result of these efforts nearly 100 tins were taken by cultivators of nearly 42 villages in Chandor taluka for using them. Tins and tar were supplied free. Many of the cultivators had either taken groundnut (Spanish peanut) or left their fields fallow for rabi crops. This had a good effect on reducing the trouble.

Poisoning of rats was successfully carried in Dangs.

The trouble from beetle bug is on the increase and it cannot be handled for want of funds. Stray trials with cynogas were arranged and it has been found that it will prove useful in killing the insect. But trials are needed to find out how to bring the remedy within the means of cultivators or in other words how to make it economic and secondly the life history of the pest is to be studied so as to find out the weak points in its life cycle.

Nothing could be done for the destruction of wild pigs. Stray attempts were made by two Taluka Development Associations, namely, Raver and Kadwa Canal, by giving guns either to paid servants (Raver) or giving it to the fieldman. Few kills have been reported and it has been found useful to scare away the animals for some time at least.

Work of tractor.—The work was continued under the supervision of the District Local Board, West Khandesh, in Dhulia and Sakri talukas. The work during the year was not adequate due to illness of the driver and breakdowns. It has been noticed that the tractor cannot be taken to long distances without damage to the machine. To get a satisfactory work it should be worked in a concentrated area. Too much shifting on road shatters the machine. Area ploughed this year was only 100 acres.

Field Embankments.—The services of one of the graduates were spared for this work and Mr. J. N. Purandare, B.Ag., who was working as Head Master, Agricultural School, Dhulia, was put on the job from 1st February 1929. He was sent for training in S. C. D. and College of Agriculture for about a month and a half, under the Bunding Officer, S. C. D., and the Professor of Engineering. In order to get practical training, he visited three places under different conditions and prepared nearly nine schemes under the guidance of the Embankment Officer, S. D., Dharwar, who had been specially deputed to this division for the purpose. As the season was very much advanced, none of these schemes could be executed before rains. Regular work was started from November 1929. During the year under report he visited 51 sites in nine talukas, in all the three districts, completed 40 individual schemes and 11 are yet to be completed. Out of 40 schemes, nine have been executed by the applicants and ten are under construction.

The remaining 21 have been recommended for loan and will be taken up after receipt of loan.

Applicants for services of Bunding Officer have to pay an advance of Rs. 10. This is found necessary to get the full benefit of his services.

Work done by the Mechanical Assistant.—Besides regular inspection and repairs of Farm machinery, the Mechanical Assistant attended to the repairs of boring machines. He attended to the following works:—

1. Site survey at 8 places and necessary advice for machinery.
2. Preparation of rough estimates for three cultivators for pumping plants.
3. Attending to the erection work at Dhurkheda in Shahada taluka.
4. Arranging to pump out water at Sangvi Farm at the time of excavation of the well under construction.

Boring work.—Mr. G. S. Moghe, B.Ag., Superintendent, Jalgaon Farm, supervised the work in addition to his duties till 31st March 1930, after which he was relieved and Mr. K. V. Agashe, Boring Assistant, was put in charge till the end of the year. The staff for the section is now adequate and it is expected that the work of the machines will improve owing to regular supervision which will be possible, if adequate funds are available for repairs and purchase of necessary tools and stores. The amount sanctioned for the purpose is inadequate and the machines have to be kept idle some times for want of parts.

During the year under report the Agricultural Engineer inspected the machines and suggested some repairs which were attended to. For repairs machine No. 24 remained idle for four months and No. 11 for two months owing to accident which could not be removed early as no fishing tools for the purpose are given to this division. There is a great necessity of such a set to avoid delay. All the three machines are worked with 3" tools. In spite of all these difficulties the total output is satisfactory. The total footage bored this year was 1105'-8" as against 761' of last year, and the number of working days was 350. Total number of bores taken was 23 out of which 12 were successful, 6 left by the Department, 3 left by well owners and 2 are in progress. There is possibility of improving the work of these machines provided sufficient amount is provided for spare parts, fishing tools and also for the travelling allowance for the supervising staff. The statement of particulars of bores made in this Division from 1st of July 1929 to 30th of June 1930 showing cost of bores, etc., is enclosed as appendix C.

Education.—During the year under report, Mr. S. K. Ghorpade, B.Ag., remained in charge of the Agricultural School, Dhulia, as Head Master, till the 14th of June 1930 when he was relieved by Mr. S. S. Surve, B.Ag. He went in foreign service.

The total number of students attending the school during the year 1929-30 was 31 of which 15 were in the second year and 16 in the first year. The students when taken by districts are—

from East Khandesh	..	..	14
„ West Khandesh	..	..	6
„ Nasik	..	..	11
and by caste—			
Marathas	..	..	13
Brahmins	..	..	1
Other backward classes	..	..	17

There was no change in the school curriculum. All necessary arrangements to teach weaving, carpentry, management of engine, etc., have now been made in the school premises.

Instead of paying all boarding expenses, the local committee, in charge of boarding arrangements, arranged to give a scholarship of Rs. 9 only and the boys had to make up the difference.

The farm had greatly improved and had produced fairly good crops in spite of the peculiar season.

The poultry section has attracted the attention of many cultivators as well as students. It has been a centre for distributing improved types of birds. The sales during the year amounted to Rs. 112 against Rs. 59 of the last year. From the records kept it has been observed that the laying capacity of leg-horn hens goes down after second year in Dhulia.

The cost of education during the year 1929-30 was :—

	Rs.
Teaching establishment	3,784
Capital expenditure (purchase of dead stock, live stock, etc.)	528
Recurring charges—(cultivation, upkeep of live stock, machinery, etc.) ..	3,137
Maintenance of students	2,851
Total ..	10,300

The amount collected by the local committee to defray the boarding expenses of students during the year under report was Rs. 3,028.

The receipts credited into the treasury from the sale proceeds of farm produce and poultry amounted to Rs. 1,505.

The annual examination was conducted by Mr. Y. R. Hulkoti, B.Ag., Inspector of Agricultural Schools and Mr. B. K. Vaishampayan, B.Ag., Graduate Assistant. All the 15 students in the second year passed while 13 from the first year successfully passed and two were promoted.

There are 14 Agricultural Bias classes in this division. The examinations are conducted by the officers of the Agricultural Department. Help is also given in laying down crops or in explaining theory. The working of these classes is improving.

Leaflets.—During the year the following leaflets were written and sent for printing :—

- (1) Hints to growers of Banilla cotton, in Marathi.
- (2) Banilla cotton cultivation, in Marathi.
- (3) How to prepare seed cotton for sale and practice of suspense sale of cotton.

During the year under report, the Hon'ble Mr. B. V. Jadhav, M.A. LL.B., Minister of Agriculture, paid a visit to this division. During his stay he enquired about :—

1. Phad system of irrigation.
2. Working of Taluka Development Associations.
3. Working of big private farms at Ravalgaon in Nasik district and Utran fruit farm in East Khandesh district.
4. Government Farms and Institutions.
5. Forest grievances.

During this visit he has collected first-hand information and dealt with rural development question in a satisfactory way. He has expressed his satisfaction on the work done by the Taluka Development Associations.

The Staff has done good work. Mr. M. B. More has done very good work in improving the Cattle Breeding Farm at Sangvi which needs recognition.

Our thanks are due to all members of the Taluka Development Associations and other organisations as well as to the officers of other Departments for the whole-hearted co-operation and help rendered in popularising the work of this Department.

Nasik, August 1930.

K. M. PAWAR,
Deputy Director of Agriculture,
North Central Division, Nasik.

APPENDIX A

Statement giving yield, ginning percentage and rates obtained in the year 1929-30

Serial No.	Place	Area in acres	Yield per acre in lbs.	Ginning percentage	Banilla Cotton		
					Rates obtained for purified cotton		
					Lint Boja (392 lbs.)	Lint Palla (240 lbs.)	Mauud Seed Cotton
1	Pachora	1,961	270	39 to 40	Rs. a. ..	Rs. a. 78 14 81 0	Rs. a. ..
2	Nashirabad	55	415	38 to 39	127 14	..	..
3	Asoda	20	475	40 per cent.	127 14	..	..
4	Raver	375	256	38 per cent.	..	..	11 6 (42 Srs.)
5	Bhusawal	844	198	38 to 40	123 0	79 14 81 0	..
6	Amalner	2,235	340	38 to 39	125 0	..	22 0 (823srs.)
7	Jalgaon	927	333	35 to 38	123 to 129	..	..
8	Shirpur	479	378	38 to 39	116 4	..	..
9	Brandol	195	300	37 to 38	123 0	..	..
10	Chopda	94	269	37 to 39	115 0	..	..
11	Parola	435	335	37 per cent.	125 0	..	..

Serial No.	Place	Area in acres	Yield per acre in lbs.	Ginning percentage	Local Cotton		
					Rates obtained per		
					Lint Boja (392 lbs.)	Lint Palla (240 lbs.)	Mauud Seed Cotton
1	Pachora	1,312	320	34 to 35	Rs. a. ..	Rs. 65 to 80	Rs. a. ..
2	Nashirabad	66	366	32 per cent.	109 0	..	..
3	Asoda	22	410	..	110 0	..	..
4	Raver	200	210	..	..	..	9 6 (42 Srs.)
5	Bhusawal	..	200	..	114 0	64	..
6	Amalner	..	320	30 to 33	..	..	17 to 18 (82 Srs.)
7	Jalgaon	..	..	..	104 to 112	..	..
8	Shirpur	..	380 to 400	32 to 33	104 0	..	..
9	Brandol	..	..	..	106 0	..	..
10	Chopda	..	..	..	109 0	..	..
11	Parola	..	..	..	118 0	..	..

APPENDIX A.—*contd.*

Serial No.	Place	N. B. Cotton						Value in rupees per acre		
		Area in acres	Yield per acre in lbs.	Ginning percentage	Rates obtained per			Babi-lla	Local	N. B.
					Lint Boja (392 lbs.)	Lint Palla (240 lbs.)	Maund Seed Cotton			
					Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Pachora ..	..	..	..	..	..	..	35	30	..
2	Nashirabad ..	40	470	35 per cent.	110	..	..	52	33	48
3	Asoda ..	15	512	..	110	..	..	63	37	50
4	Raver ..	..	..	..	..	..	..	35*	24*	..
5	Bhusawal ..	..	..	..	..	..	..	24	17	..
6	Amalner ..	..	..	..	..	..	..	41	33*	..
7	Jalgaon ..	..	..	..	..	..	..	36	..	..
8	Shirpur ..	..	425	34 to 35	106	..	..	43	33	39
9	Erandol ..	..	..	..	..	..	..	35	..	..
10	Chopda ..	..	..	..	..	..	..	20	..	..
11	Parola ..	..	..	..	..	..	..	40	..	..

* Seed cotton.

APPENDIX B

Extracts giving the buyers' opinions on Banilla cotton for the year 1929-30

Letter dated 7th April 1930 from the Secretary, the Pratap Spinning, Weaving and Manufacturing Company, Amalner :—

"In reply to your D.O. No. 1219 of 5th April 1930 we have the honour to say that the Banilla cotton is better than the ordinary one and 18's counts can easily be spun with the average test from 60 to 63 lbs. There seems much variation in different lots in point of staple and softness, but if the cultivators be properly guided and proper care taken in the selection of seed and purification of crops, there seems to be a chance of turning out still a better stuff.

With the ordinary cotton not more than 14's to 15's counts can be spun at the usual working rates of turns per inch while Banilla cotton can be spun up to 17 to 18's counts which shows its fair superiority over the former."

Letter dated 20th March 1930 from Messrs. Tamboli Brothers, Amalner :—

"With reference to your No. 888 of 8th March 1930, we hereby declare as the opinion on Banilla cotton as under :—

Empress Mills, Nagpur

Amalner Banilla—

Counts 16's. Blow-room loss 11·08. Tension 80·85.

Jalgaon Banilla—

Counts 20's. Blow-room loss 11·22 Tension 51·38.

Advance Mills, Ahmedabad

Amalner Banilla—

Average counts 19·76's. Blow-room loss 10·5. Tension 80·45."

Letter dated 3rd April 1930 from Bhagirath Mills, Jalgaon :—

"We have purchased this cotton in a quantity available in the market and have tried the same at different times.

At the end of January the counts spun from this cotton stood to 19·45 and test 65 lbs. To-day 18·50 and test 64 lbs.

The cotton is soft and silky, but little weak in staple, requires more humidity and will show better results in humid atmosphere."

Letter No. 3514 of 11th March 1930 from the New Ginning, Pressing and Manufacturing Co., Ltd., Chalisgaon :—

"With reference to paragraph 2 of your letter No. 889 of 8th March 1930, we have to opine on Banilla cotton as follows :—

Jalgaon No. 1—10 per cent. loss, 20's counts.

Jalgaon No. 3—10 per cent. loss, 16's counts.

Average counts—

19·60, test 60 lbs.

15·26, test 70 lbs."

Statement showing particulars of Boring work done

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of bore
1	2	3	4	5	6	7
<i>Nasik District</i>						
1	Mr. M. M. Khandke	.. ..	Nasik	Nasik Road	Well	3"
2	Do.	.. ..	Do.	Do.	Surface	3"
3	Mr. S. O. Oomrigar	P. No. 268.	Do.	Deolali	Well 52' x 14'	3"
4	Mr. Owen	.. ..	Do.	Nasik	....	3"
<i>East Khandesh District</i>						
1	Mr. G. S. Chaudhari	.. ..	Raver	Sawda	Well	3"
2	Mr. G. D. Lomate	.. 452	Do.	Do.	Do.	3"
3	Mr. T. G. Patil and Mr. B. C. Mahajan.)	.. 38	Do.	Udhali Khurd	Well 54' x 8'-6"	3"
4	Do. do.	.. 38	Do.	Do.	Do.	3"
5	Mr. T. G. Patil	.. 12	Do.	Do.	Well 52' x 8'-6"	3"
6	Do.	.. 12	Do.	Do.	Do.	3"
7	Mr. Zendu Motiram	.. 101/1	Do.	Do.	Well 66' x 8'-6"	3"
8	Mr. Awasu Ganesh and Mr. Zendu Bulakhi.	.. 376	Do.	Sawda	Well 54' x 7'-6"	3"
9	Mr. Puna Sakharani	.. 368	Do.	Do.	Well 60' x 8'..	3"
10	Mr. P. I. Patil	.. 258	Do.	Do.	Well 60' x 8'..	3"
11	Do.	.. 202	Do.	Do.	Well 70' x 7'-6"	3"
12	Mr. A. S. Dohole	.. 372/2	Do.	Do.	Well 68' x 10'	3"
1	Mr. N. B. Patil	.. ..	Chopda	Chahardi	Well 50' x 9'	3"
2	Do.	.. 88	Do.	Do.	50' x 9"	3"
3	Do.	.. 88	Do.	Do.	50' x 9"	3"
4	Mr. S. D. Patil	.. 483	Do.	Do.	Well	3"
5	Mr. M. M. Pirjade	.. 372	Jalgaon	Meharun	Do.	3"
6	Mr. T. B. Bhoite	.. 487	Do.	Jalgaon	Well 56'-10" x 13'-6"	3"
7	Mr. Jannadas chhodas.	Ran- 223	Do.	Do.	Well 45' x 13'	3"

in the North Central Division, in the year 1929-30

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charge	Cost of fuel, lubricant, coal, carting, casing pipe, cutting shoe, etc.	Departmental charges for the well owner	Supervision and depreciation
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
75'-0"	NH.	NH.	NH.	112 8 0	98 8 0	201 4 0	185 1 7
82'-0"	NH.	300	300	112 8 0	98 8 0		202 6 0
94'-0"	NH.	NH.	NH.	268 12 0	273 2 9		182 10 2
48'-0"	NH.	..	..	..	....	....	....
68'-0"	NH.	1,500	1,500	36 0 0	59 0 0	72 12 0	86 5 8
50'-0"	NH.	1,500	1,500	15 0 0	62 12 0	58 4 0	68 8 6
21'-2"	300	..	..	77 0 0	88 15 0	44 4 0	28 15 11
31'-3"	300	1,800	1,500				57 1 9
37'-0"	300	..	..				50 10 11
45'-0"	300	1,800	1,500	79 0 0	98 0 0	45 0 0	61 10 10
54'-0"	NH.	1,500	1,500	55 0 0	77 0 0	56 0 0	74 0 3
41'-6"	200	1,700	1,500	24 0 0	92 8 0	41 8 0	56 13 11
51'-6"	200	1,700	1,500	30 0 0	92 8 0	52 4 0	70 9 5
80'-0"	200	3,300	3,000	259 14 0	268 9 3	141 0 0	112 6 2
46'-0"	200	3,200	3,000				63 0 9
52'-0"	200	3,200	3,000	33 12 0	79 12 0	53 0 0	71 4 4
77'-0"	200	3,200	3,000	70 0 0	200 0 0	90 8 0	195 4 1
110'-0"	200	NH.	..	250 0 0	200 0 0	....	330 6 4
17'-0"	200	NH.	..				36 13 8
13'-2"	200	..	..	70 0 0	117 0 0	....	233 2 6
108'-10"	100	NH.	..	60 0 0	53 0 0	154 4 0	23 6 7
9'-0"	NH.	..	..	43 2 0	73 2 0	....	....
1'-6"	..	..	..	..	....	....	....

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well-bore with dimensions of the well	Running expenses, mechanic's wages and repairs
1	2	3	4	5	6.	16
	<i>Nasik District</i>					Rs. a. p.
1	Mr. M. M. Khandke	.. ..	Nasik	Nasik Road	Well	584 12 3
2	Do.	.. ..	Do.	Do.	Surface	581 10 10
3	Mr. S. O. Oomrigar	P. No. 268.	Do.	Deotali	Well 52' x 14'	670 3 40
4	Mr. Owen	.. ..	Do.	Nasik	.....	.....
	<i>East Khandesh District</i>					
1	Mr. G. S. Chaudhari	.. ..	Raver	Sawda	Well	278 5 7
2	Mr. G. D. Lomate	452	Do.	Do.	Do.	220 14 7
3	Mr. T. G. Patil and Mr. B. C. Mahajan.	38	Do.	Udhali Khurd	Well 54' x 8' 6"	98 8 3
4	Do. do.	38	Do.	Do.	Do.	138 1 1
5	Mr. T. G. Patil	12	Do.	Do.	Well 52' x 8' 6"	163 11 9
6	Do.	12	Do.	Do.	Do.	108 13 1
7	Mr. Zendu Motiram	101/1	Do.	Do.	Well 66' x 8' 6"	238 9 4
8	Mr. Awasu Ganesh and Mr. Zendu Bulakhi.	376	Do.	Sawda	Well 54' x 7' 6"	188 5 8
9	Mr. Puna Sakharan	368	Do.	Do.	Well 60' x 8".	227 8 8
10	Mr. P. I. Patil	256	Do.	Do.	Well 60' x 8".	353 7 3
11	Do.	202	Do.	Do.	Well 70' x 7' 6"	208 3 9
12	Mr. A. S. Dohole	372/2	Do.	Do.	Well 68' x 10".	287 3 0
1	Mr. N. R. Patil	.. ..	Chopda	Chahardi	Well 50' x 0".	594 0 4
2	Do.	88	Do.	Do.	50' x 9"	979 12 4
3	Do.	88	Do.	Do.	50' x 9"	
4	Mr. S. D. Patil	483	Do.	Do.	Well	109 5 6
5	Mr. M. M. Pirjade	372	Jalgaon	Meharun	Do.	869 11 0
6	Mr. T. B. Bhoite	487	Do.	Jalgaon	Well 58'-10" x 13'-6".	60 6 11
7	Mr. Jannadas chhoddas.	Ran-223	Do.	Do.	Well 45' x 13"	.....

C—contd.

Cost to the well owner	Cost per foot to the well owner	Total cost of the bore inclusive of well owner and Departmental cost	Total cost per foot	Object of boring—agricultural or drinking	Remarks, i.e., successful, unsuccessful, incomplete, on hand or abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
113 4 0	3 14 6	2,117 2 8	13 7 9	Agriculture	Abandoned by well owner.
674 14 9	7 2 11	1,527 12 9	16 4 1	Do.	Successful.
....	....	....	....	Do.	Abandoned by well owner.
				Do.	In progress.
167 12 0	2 10 7	532 7 3	8 7 3	Agriculture	Successful; 34 feet work done last year.
131 0 0	2 9 11	420 7 1	8 6 6	Do.	Successful.
210 3 0	4 0 1	527 14 0	10 0 11	Do.	Left by Department.
222 0 0	2 11 4	696 14 7	8 8 0	Do.	Successful.
188 0 0	3 7 8	500 9 7	9 4 4	Do.	Left by Department.
158 0 0	3 12 11	398 4 7	9 9 7	Do.	Successful.
174 12 0	3 6 3	472 14 1	9 2 11	Do.	Do.
564 7 3	4 7 8	1,296 8 10	10 4 8	Do.	Do.
166 8 0	3 3 1	524 15 4	10 1 6	Do.	Do.
360 8 0	4 11 0	1,149 12 5	14 15 0	Do.	Do.
450 0 0	3 8 8	1,760 2 8	13 13 9	Do.	Successful; 69' 3" work done last year.
187 0 0	13 8 2	333 3 2	23 8 4	Do.	Left by Department.
267 4 0	2 7 3	1,420 1 6	13 0 9	Do.	Do.
116 4 0	12 14 8	209 1 6	23 3 9	Do.	Incomplete.
....	....	....	....	Do.	Left by the owner.
				Do.	Left by the Department.
				Do.	In progress.

APPENDIX D

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, SOUTH CENTRAL DIVISION, POONA,
FOR THE YEAR 1929-30

Staff

I remained in charge of the Division throughout the whole year. During the year, in December 1929, I was out to Pusa to attend the meeting of the Board of Agriculture in India; immediately after the Board's meeting, at Pusa, I was on deputation in Bihar to study sugarcane and other kindred matters for a week. In June 1930, I also attended, as a Member, the meeting at Simla of Fertilizers' Committee appointed by the Imperial Council of Agricultural Research.

The changes in the staff were as under :—

Mr. G. P. Patil, acting Divisional Superintendent of Agriculture, Deccan Canals, Baramati, continued throughout the year except that he was on leave for a short period of 15 days in December 1929.

Mr. S. B. Jadhav, who was on long leave on medical certificate, resumed duty in January 1930 as District Agricultural Overseer, Malsiras.

Mr. A. R. Nikam, Superintendent, Kopargaon Farm, being on long leave on medical certificate from October 1929, Mr. C. A. Borudey, B.Ag., has been posted for work as Superintendent, Kopargaon Farm.

Mr. R. D. Khandekar has been on deputation in foreign service under the Shikshan Prasarak Mandal, Rajapur, from October 1929 and in his place Mr. P. S. Kulkarni is working as an acting Graduate Assistant on the Manjri Farm.

The District Agricultural Overseer, Poona, met with an accident in January 1930 whilst demonstrating magic lantern slides, owing to which he has suffered serious injuries to the right hand.

At Mohol Farm, the work of Jowar breeding has been started from this year, and the same has been left in charge of Mr. R. K. Kulkarni from June 1930 prior to which Mr. L. G. Kulkarni worked.

It has been several times reported that the activities have increased in this Division which fact could be fully realised from the facts in the report and the question of Irrigation Agriculture is becoming of great importance which has increased correspondence both in my office and on Farms. These cannot be coped with without the help of an additional staff in office, and scientific records on Farms could not be recorded and maintained until the Farms are equipped.

Season

The season for Canal, specially for cane, was normal. But for the famine areas the season was below normal in spite of the quantity of rain recorded to average.

Lines of Work

The operations of this Division are summarised under the same following heads as it was done last year to facilitate references and comparisons where needed :—

- (I) Research.
- (II) Propaganda.
- (III) Agricultural Organisations—
 - (A) Taluka Development Associations and
 - (B) Non-Credit Co-operative Societies.
- (IV) Agricultural Services—
 - (A) Boring Operations.
 - (B) Engineering Advice and Assistance.
 - (C) Pig Killing Operations.
 - (D) Field Embankments.
- (V) Agricultural Education.
- (VI) Departmental Administration.

Section I

Research

Mangri Farm.—The line of experiment on this Farm has been continued as reported in the previous reports. The experiments that have shown conclusive results have been deleted and those in progress, which are showing interesting results, are summarised below :—

Nitrogenous top dressing reduction series.—This experiment, which has its object to see whether in cultivators rotation and system of manuring with Farm Yard Manure the dose of nitrogen top-dressing could still be further taken down below 150 lbs. N. has been conducted in 4 replicates for the last two years. The results obtained are summarised below. As the cycle is not complete, conclusions are not drawn :—

Serial No.	Treatment	Weight of cane per acre (average of 4 replicates)		Weight of gul per acre (average of 4 replicates)	
		1928-29	1929-30	1928-29	1929-30
		lbs.	lbs.	lbs.	lbs.
1	F. Y. M. 30 cart-loads +75 lbs. N. ..	89,713	98,866	11,277	12,683
2	F. Y. M. 30 cart-loads +112½ lbs. N. ..	96,380	102,775	11,649	13,035
3	F. Y. M. 30 cart-loads +150 lbs. N. ...	101,051	100,457	12,320	12,591

Farm Yard Manure Reduction Series.—An experiment similar to the one above has been laid down to see whether the dose of farm-yard manure could still be further reduced from 30 cart-loads to 20 and 15 cart-loads keeping the nitrogen top-dressing to 150 lbs. N. constant. This is also being conducted in replicate and the results of one year only are available which are not very much marked.

Irrigation Experiments, Interval Series.—This experiment has been continued for the last 7 years. The interval of watering kept was of 8, 10 and 15 days with the quantity of water almost same exclusive of annual rain-fall. The results obtained are summarised below :—

Treatment	Weight of cane per acre in lbs.							Average
	1923-24	1924-25	1925-26	1926-27	1927-28	1928-29	1929-30	
8 days ..	71,978	75,780	77,434	84,276	68,192	76,721	84,345	76,960
10 „ ..	52,107	73,572	72,665	88,578	67,111	77,482	92,073	74,797
15 „ ..	57,359	58,833	80,330	81,077	71,406	73,035	70,554	70,370
	Weight of gul per acre.							
8 days ..	8,624	10,826	10,322	10,711	10,133	10,949	11,569	10,447
10 „ ..	6,008	9,113	9,190	11,251	9,903	10,243	12,038	9,677
15 „ ..	6,391	8,241	9,909	9,705	9,851	9,976	9,367	9,063
Rainfall in inches ..	13.4	25.9	15.04	19.67	24.94	23.94	20.96	
Rainy days ..	47	65	78	80	93	76	86	

The results have proved the following :—

- (1) Eight-day turn is the best and has given the maximum yields.
- (2) Ten-day turn stands next to eight-day and is still superior to 15 days.
- (3) Fifteen-day turn has yielded low. The experiment has been abandoned and new one, suiting the intervals according to seasons, has been substituted instead.

Local Method vs. Manjri Standard Method of Cultivating Sugarcane.—This experiment has been continued and the results obtained during the year are tabulated below :—

Treatment	Weight of cane	Weight of gul	Brix	Value	Cost	Profit
	lbs.	lbs.		Rs.	Rs.	Rs.
(1) Manjri method ..	75,101	10,188	20.82	905	596	309
(2) Local method ..	89,090	11,891	20.44	1,056	883	173

Selection of profitable varieties.—The varieties, HM544, J213 and HM89 were tried in comparison with Pundia and it is found that J213 has given

the highest yield in comparison with other varieties even though the extraction is 61·8 per cent. as against of Pundia 68·7 and HM544 72·1 per cent. HM544 has been already reported to be late and having low brix. Even though it has been found even on Manjri Farm to give in a stray plot yield as high as 13,280 lbs. gul per acre in the year ; unless the spasmodic habit of this variety is studied from the point of soil, manure, planting and harvesting time, etc., it is difficult to say about its success or superiority. This has been given up from the trial.

Diversification in Sugarcane farming.—The object of this series when lined out in 1926-27 was specified as under :—

“To find out the most profitable crop for rotating with sugarcane, as well as to study the effects of the different rotations in maintaining the physical condition of the soil without deteriorating in any way the yields of the Pundia variety of cane as it is believed that the land is tending to become Pundia sick.”

The following shows the crop rotated in each series :—

(I) Four-year rotation with Sann—

(a) Sugarcane—Cotton—Nilawa—Sann.

(b) Sugarcane—Groundnut (Spanish peanut)—Nilawa—Sann.

(II) Four-year rotation without sann but with Farm Yard Manure dose of 40 cart-loads for cane-crop—

(a) Sugarcane—Nilawa—Turmeric—Groundnut (Spanish peanut).

(b) Sugarcane—Nilawa—Cotton—Groundnut (Spanish peanut).

One turn of the above cycles has been completed and the results are now available. Amongst many other points, which require further corroboration, these results have so far proved the following points :—

(1) Where rents are high, the 4-year cycle of rotation is less economic than 3-year Manjri Standard method rotation, as the burden of rent on cane is high in 4-year rotation.

(2) The crop of Nilawa seems to be essential as it supplies sufficient fodder and at the same time is hardy.

(3) Monetary crops like Cotton, Groundnut and Wheat seem also essential as proper adjustments for soil labour and monetary points to a cane-grower in canal area.

Visitors.—The farm was visited by His Excellency the Governor of Bombay on 8th October 1929 and his remarks are as under :—

“I was glad to have an opportunity of seeing the many instructive experiments which are being carried out at the Farm with the object of improving the sugar industry.

The dry farming research station is an important addition which must have great interest for all dry-crop cultivators.

I recognize that the work of this Farm is of great value to agriculture in this Presidency and I trust it will continue to prosper.”

Profit and Loss.—The following statement will give an idea of the cost of cultivation, value of produce, profits and yield per acre for 5 years as per standard method of Manjri Farm :—

Year	Cost of cultivation	Value of produce	Profit per acre	Cost per unit of labour	Average yield of gul per acre	Rate of gul in lbs. per rupee
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	lbs.	lbs.
1925-26 ..	635 9 0	926 6 0	290 13 0	0 11 0	9,264	10
1926-27 ..	623 13 0	903 13 0	279 15 7	0 11 0	9,942	11
1927-28 ..	626 8 0	829 2 8	202 10 8	0 11 0	9,950	12
1928-29 ..	593 3 3	885 14 3	292 11 0	0 10 0	9,302	10½
1929-30 ..	596 4 4	905 2 6	308 14 2	0 10 0	10,188	11½

Trial of Berseem.—The experiment reported in last years report has been continued. The yields obtained of Berseem fodder, cotton and sugarcane were as under :—

Name of crop	Yield in lbs. per acre
(1) Berseem ..	34,000 (green fodder).
(2) Cotton (a) in block ..	1,636 (seed cotton).
(b) in non-block ..	1,358 (seed cotton).
(3) Sugarcane (J213) ..	10,200 (gul).

Baramati Farm.—The season for cane was normal. The average yield obtained was 10,899 lbs. gul per acre as against 10,645 lbs. in 1928-29. In some plots higher yields up to 14,620 lbs. of gul per acre have been recorded even this year.

Kopargaon Farm.—The average yield obtained on the Farm of Plant and Ratoon was 12,889 and 9,583 lbs. as against lbs. 10,248 and lbs. 8,673 of 1928-29.

Varietal trial of cane.—To the original list of varieties (viz. HM544, D109 and Pundia), J213 and HM89 have been added for comparison. It is again found this year, in a cycle that HM544 has stood below Pundia and D109, the latter showing superior yield.

Nitrogenous top-dressing experiment.—The third cycle of this experiment has been completed this year and the results taken of 3 cycles together corroborate the remarks made in last year's report that 200 lbs. N. top-dressing dose is an economic dose and has given fairly good yield when compared to higher doses.

Mohol Plot.—Kharif rains were not favourable for cotton sowing and hence cotton was not sown. The whole area was cropped with rabi jowar after rains in September. The average yield inspite of bad season secured was 406 lbs. of Jowar and 897 lbs. fodder per acre.

The experiment of grading *vs.* non-graded seed in Jowar was tried and again it showed its superiority in yield. The yields obtained were (graded) 742 lbs. grain and 1,144 lbs. fodder against 532 lbs. and 874 lbs. (non-graded).

Experiments conducted by the Soil Physicist and the Plant Pathologist would be reported by them separately.

During the year, on this farm, rabi jowar breeding work has been commenced with the advice of the Economic Botanist for which a graduate has been made available. During the year, 58 selections of Maldandi Jowar were grown, out of which 31 have been selected for further study. In addition to this, the Graduate Assistant has collected 87 typical selections from Maldandi standard crop from Sholapur and Bijapur districts for further study.

Section II

Propaganda

The principal items of the programme of the district staff are as under :—

(a) *The Popularization of the Copper Sulphate Treatment for Jowar—*

The following shows the total distribution of Copper Sulphate packets distributed, district by district :—

Name of district	No. of packets distributed in 1929-30
(a) Nagar	3,951
(b) Sholapur	4,764
(c) Satara	2,373
(d) Poona	631
(e) Canal area (including Nira Right Bank Canal)	2,933
Total ..	14,652

In addition to the actual distribution of the packets, Jowar seed, sufficient for 2,000 acres, was got steeped under the instructions of the departmental officers and supplied to cultivators for sowing.

(b) *Introduction of new crops and varieties—*

(a) *Introduction of cane varieties in the canal tract.*—The variety HM544 of cane was further tried on all canals. It was reported in last year's report that the area under this variety is dropping as it is found to be late ; Even this year, it has dropped to about 57 acres against 200 in 1928-29.

During the last three years the variety has received full trial on canals and the results obtained, even though in some cases showing low yields, seem to be worth recording and hence these are tabulated below :—

**Trial of HM544 on Deccan Canals vs. Pundia from
1925-26 to 1929-30**

Name of Canal	1925-1926		1926-27		1927-28	
	HM544	Pundia	HM544	Pundia	HM544	Pundia
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Nira Left Bank Canal.	14,322 (Plant)	14,016	13,644	..	12,520	12,080
Godawari Canals.	..	..	..	..	(Plant) 9,779	(Plant) 9,353
Prawara Canals.	..	..	..	..	Ratoon 12,320	Ratoon 11,462

Name of Canal	1928-29		1929-30		Remarks
	HM544	Pundia	HM544	Pundia	
	lbs.	lbs.	lbs.	lbs.	
Nira Left Bank Canal.	10,158	10,315	9,707 14,040 (maximum)	10,290 14,100	As September and October plantings HM544 has given 12,008 lbs. of gins against 10,348 of Pundia per acre.
Godawari Canals.	plant 7,408	plant 8,191 (Frost year)	..	..	
	Ratoon 6,385	Ratoon 6,740	Ratoon 7,417	Ratoon 7,298	
Prawara Canals.	8,320	10,000	9,576	10,080	

Note.—The above are the average yields of several plots.

In some places it has kept its record yield, which shows that thorough study of soil suitability, manuring, planting and harvesting time, etc., in spite of lateness is essential, whenever such a variety is introduced in the tract for a longer period.

(b) *Introduction of N.R. Cotton on Canal-area and Nagar and Sholapur districts.*—The year was not a favourable one as there was a very long drought in July and August which was followed by heavy rain. This naturally made the bolls drop down. The average yield obtained from demonstration plots on different canals were as under :—

Name of canal	Average yield of seed cotton per acre 1929-30
	lbs.
(1) Nira Left Bank	900
(2) Nira Right Bank	600
(3) Godawari Canals	750
(4) Prawara Canals	700

Maximum yields varying from 1,300 to 1,936 lbs. were obtained in a few cases.

The area under N.R. Cotton on Canals was at its highest, in the year 1929-30 when compared with the past year.

Arrangements were made to distribute on all canals 72,763 lbs. N.R. seed. Besides this, local merchants have been making a business in regular distribution of N.R. seed.

The quantity of N.R. seed distributed in Nagar and Sholapur districts was 8,000 lbs. and 2,230 lbs. respectively.

(c) *Introduction of Groundnut varieties.*—The following statement shows the distribution of groundnut seeds in different districts :—

Name of variety	Quantity distributed in each district	
	Nagar District	Canal area
	lbs.	lbs.
(1) Spanish Peanut	1,000	8,780
(2) Big Japan	800	..

(d) *Introduction and dissemination of Akola Bajri.*—The importance of Akola variety of Bajri is now too well known. During the year, 11,620 lbs. Akola Bajri was exported to different places in this Division.

(e) *Introduction of new crops like Pusa-4 Wheat, Potatoes, Ginger and Tobacco crops in canal area.*—

(a) *Pusa-4 Wheat.*—This has now spread in a major area on canals being resistant to rust and has been substituted in place of Khapli.

(b) *Potato and Ginger.*—These crops are only taken slowly being delicate and likely to be affected by several diseases.

(c) *Tobacco.*—The area under this crop has now increased to 200 acres. The varieties Nipani and Adcock were tried and help was rendered to cultivators on canals for curing and making marketable tobacco.

(c) *Introduction of improved methods in sugar-cane growing (canal area).*—

(i) *Wide method of planting canes.*—The cane growers on the development canals have already adopted a distance varying from 3-3½' to 4' in long rows as against 2½' in beds as a result of demonstration of this method for the past 10 years and hence propaganda in this direction is being reduced.

(ii) *Reduction of manure in cane growing.*—As regards this regular plots have been laid down to show comparative benefits of 150 lbs. N. dose to cane crop and these are being demonstrated.

(iii) *Modified Java Method of Planting Cane.*—The area under this method during the year on different canals was as under :—

Name of Canal	Area under modified Java method	
	Acres	
(1) Godavari Canals	..	13
(2) Pravara Canals	..	12
(3) Nira Left Bank Canal	..	5

(d) *Spraying and Fumigation Operations.*—The importance of spraying for diseases is being realised by cultivators whenever the disease occurs. In Saswad, 8 acres and 10 gunthas potato crop was sprayed and Rs. 12.15-0 was recovered as fee.

(e) *Grass-Hopper Campaign.*—The attack of wingless Grass-hoppers was not so severe as in the past. In order to corroborate the past results, campaign was undertaken at three places in the Division, at two places in Satara District with the help of the Taluka Development Associations, Walva and Khatav and at one place in Poona District independently. The results achieved are tabulated below :—

Place of campaign	Area protected	No. of operations		Cost of each operation	Comparison of yield from protected and non-protected area
		Tin	Bag		
(1) Islampur, Satara District.	A. 266 g. 18	2	..	0 12 0 per acre per turn.	Yields not available but the area protected was saved and fairly normal crop was reaped.
(2) Khatav, Satara District.	146 0	3	..	0 13 0 per turn per acre.	Do.
(3) Lohegaon, Poona District.	80 0	1	5	0 5 0 per turn of tin. 0 2 7 per turn of bag.	Do.

(f) *Horticultural operations.*—The work in this section has been on an increasing scale, both on the canal zone and in other districts. In canal area, the area under different varieties of fruits is increasing whilst the other districts are developing Bor Budding operations. As a result of holding two Horticultural classes at Satara, one in 1927 and the other in 1930, the activities in Satara District show signs of taking a permanent hold and the Taluka Development Association, Satara, with the help of the District Local Board grant of Rs. 1,000 has arranged for an establishment of a permanent Nursery at Satara and distribute the necessary grafts and seedlings and serve in the end as a training ground for cultivators of the Satara District. The Horticulturist to Government of Bombay had all along helped this Division with the limited staff and T. A. at his disposal, but there seems a sheer necessity of a permanent arrangement in this section to cope with the increased activities both on the Canals and on the District, without which the work could not be coped.

(g) *Implement Depôts.*—It will be seen from the census of the Agricultural Stock printed in the season and crop report of the Bombay Presidency for 1929-30 that in this Division nearly 40 to 50 per cent. plows at each village are iron plows and hence the demand for hire has been decreasing. The total hire received at all the depôts, etc., in this Division amounts to Rs. 1,152-5-6.

(h) *Shows and Demonstrations.*—The Agricultural propaganda is conducted through the following methods :—

(1) organised shows, (2) demonstration of implements, manures, new varieties of crops, steeping and spraying as a means to prevent diseases of crops, (3) jamabandi demonstrations, and (4) organisation of depots of implements and manures and seed societies for purchase of sale of cultivators produce.

During the year, no district show was held but the Deccan Agricultural Association, Poona, and the Taluka Development Association, Patan, organised shows at Khed—Shivapur and Yerad which were helped by the department, both from monetary point of view and men. These were largely attended by cultivators.

Items 2, 3 and 4 mentioned above.—Two and three have been reported separately in the summary of work of each district ; while information in respect of 4 is given under the work of non-credit societies mentioned in section III of this report.

(i) *Agricultural Classes.*—The following three types of classes were held in this Division :—

Serial No.	Name of the class	Object.	Specific tracts for which these were meant	Period	Attendance
				Days.	No.
1	Irrigated Crops Class, Rahata (Godawari Canals).	To impart instructions on mainly irrigated crops like Cane, Cotton Groundnut, etc., on Canal.	Canal tract	10	110
2	Horticultural Class at Satara (with the help of the Taluka Development Association, Satara).	To impart instructions on fruit growing.	Satara District.	10	70
3	Land Development and Plowing class (with the help of Taluka Development Association, Walwa).	To impart instructions in (1) land development, and (2) plowing with iron plows.	Walwa and Shirala peta.	7	40

The class at Rahata was also attended by subordinate staff of the Irrigation Department and the attendance includes cultivators from Phaltan State and Nasik District. Department is indebted to Mr. Prithaviraj Shet of Rahata for sparing his building and garden free to hold the class.

The arrangement of teaching was by lectures in the morning, actual practical work in the noon and visits to best managed estates. The success of Horticultural class at Satara is solely due to Mr. H. P. Paranjape of the staff of the Horticulturist to Government of Bombay who imparted throughout the period instructions on fruit growing. The

success of Land Development Class is due to enthusiastic help of Mr. K. R. Patil, President, and Mr. L. A. Phalatane, Honorary Secretary of the Taluka Development Association, Walva.

The cultivators who attended these classes have been found to have been much impressed with the instructions imparted and it is found that several have commenced to adopt hints on their estates in the management of crops and gardens. This naturally goes to prove of the success of such classes.

(j) *Leaflets*.—During the year under report the following old leaflets were revised :—

Serial No.	Name of leaflet	English	Mara- thi
1	Land Leveller	..	1
2	Methods of field irrigation	1	..
3	Groundnuts—cultivation of Spanish peanut	1	..
4	Manure for Potatoes	1	1
5	Cultivation of Potatoes in Poona District	1	..

(k) *Summary of work done in each District and on Canal area—*

(1) *Poona District*.—The work of demonstrating crops and improved methods of crop growing was conducted on the same lines as reported previously. Spanish Pea-nut plots yielded from lbs. 820 to lbs. 2,492 of pods per acre. Pusa-4 has yielded from 900 to 1,920 lbs. per acre under irrigation. Extensive propaganda of seed-grading and dry-farming method was done by concentrating at fixed centres. As regards seed grading at 16 villages, 110 cultivators graded 15,950 lbs. seed. The average yield obtained from graded plot was lbs. 1,003 as against lbs. 863. Experiments conducted according to dry farming methods with Rabi Jowar have shown the following average yields:—

Treatment	Yield per acre of	
	Grain	Fodder
	lbs.	lbs.
(1) Dry farming method	600·9	1,077·2
(2) Local method	282·5	721·6

Two Jamabandi, 10 crop and 14 implement demonstrations were held. He rendered help for organising a show at Khed-Shivapur held by the Deccan Agricultural Association, Poona, and to the Taluka Development Association, Khed and Junnar, for conducting their propaganda. In this District, concentrated work of agricultural importance through three co-operative credit societies has been commenced.

(2) *Ahmednagar District*.—The District Agricultural Overseer, Ahmednagar, mostly concentrated his work on “Mass Propaganda”

a new scheme of conducting only three or four improvements, to every corner in the district. About this scheme, mention has been made in last year's report. The main agricultural improvements to be demonstrated were :—

- (1) advantages of graded *vs.* non-graded seed of rabi jowar and
- (2) advantages of dry farming method over local method of growing rabi jowar.

The District Agricultural Show Committee, Ahmednagar, contributed Rs. 1,217 for (1) the preparation of 42 sets of new implements, (2) printing of leaflets and (3) remuneration to teachers for working as demonstrators. The department contributed by an additional 3 temporary kamgars and additional T. A. to the existing staff in Nagar District. 42 centres, in 11 Talukas, were selected which were mostly weekly bazaar places. At these centres, demonstration plots were arranged to show the above advantages in cultivator's fields. 25 local school teachers helped four times during the season on weekly bazaar days at each centre for demonstrating the crop and showing benefits. Similarly, the departmental kamgars also did the same work. In addition to these, big demonstrations at 25 centres were held under the auspices of Government officials and local landlords, which were largely attended. The Show Committee distributed 4,000 leaflets and bulletins on these methods. The result of this work shows that nearly 6,000 cultivators (besides a large number of students) have come to know about this work. Another immediate result of this work is that cultivators have offered 430 acres of land at these centres for demonstrating on a large scale and there has been a great demand for the improved implements.

The average yields of demonstration plots obtained are summarised below :—

Treatment	Yield per acre of		Increase 90 %.	
	grain	fodder	grain	fodder
	lbs.	lbs.		
(1) Graded	311	893	19%	10%
<i>vs.</i>				
(2) Non-graded	269	830	..	..
(1) Dry farming plots	415	1,054	65%	27%
(2) Local plots	266	812	..	..

The scheme is being continued with large scale trials.

In addition to this, he arranged 5 jamabandi demonstrations and about 60 crop and implement demonstrations (which includes demonstration of mass propaganda). He helped the Co-operative Implement Societies at Shevagaon, Jamkhed and Pathardi.

(3) *Satara District*.—The work of the ten Taluka Development Associations was guided and supervised by the District Agricultural Overseer. In addition to it several demonstration plots were managed. He helped mainly in the conduction of Horticultural class at Satara by the Taluka Development Association; Satara, Land Development and Plow class at Walva and organisation of Show at Yerad in Patan Taluka. In addition, 8 Jamabandi and 10 crop demonstrations were organised and helped.

(4) *Sholapur District*.—In this district, during the year under report, 4 field bunding and implement, 43 seed-grading 25 inter-culturing Jowar and Groundnut crops and 17 crop demonstrations were organised. The special propaganda of seed-grading mentioned in last year's report was continued and 100 plots were kept under observation at different centres of graded *vs.* non-graded Rabi Jowar seed and the results have been recorded. The average yield of all was as under in comparison with the past two years :—

Treatment	Yield in 1927-28		Yield in 1928-29		Yield in 1929-30	
	Rabi Jowar		Rabi Jowar		Rabi Jowar	
	Dry Irrigated		Dry Irrigated		Dry Irrigated	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
(I) Graded	1,009½	1,874	758	1,030	455	962
(II) Non-graded	737	1,564	458	650	357	768
Average increase per cent. over non-graded	36.9	19.8	65.5	59	27.4	25.3

As a result of this propaganda, in Sholapur District 424,480 lbs. of Jowar seed was graded and sown. Departmental staff graded 180,000 lbs. and the remaining quantity by the Madha and Karamala Taluka Development Associations. 411 sieves for grading seed were distributed. Every co-operative credit society has now got a set of sieves which are allowed for use to members. Help was rendered to Taluka Development Associations and Implement Societies. Concentrated work of Agricultural improvements through 4 credit societies has been commenced.

(5) *Canal Area*.—(This includes Nira Right Bank, Nira Left Bank and Godavari and Pravara Canals).—On the Canals, 61 demonstrations were held to show the advantages of N.R. Cotton, Tobacco, Potato, Ginger, Fruit-culture, seed grading in Jowar, interculturing cotton, cane varieties, sann green manuring and Java method of planting cane. These were largely attended by cultivators and the benefits are being realised. The staff arranged to grade 38,084 lbs. of seed of Jowar and

the yields obtained of graded and un-graded seed on different canals averaged from several demonstration plots are as under :—

Name of Canal	Yield of Rabi Jowar under irrigation		Increase % of yield
	Sown with graded seed	Sown with non-graded seed	
	lbs.	lbs.	
Nira Left Bank Canal	1,021	888	15%
Godavari Canals	480	350	37%
Pravara Canals	569	490	16%

Sann green manuring for Sugarcane was demonstrated in 12 cultivators' fields and the crop has yielded on an average 20,301 lbs. green weight per acre. Maximum in one case is 35,421 lbs. Concentrated work of agricultural improvements has been commenced through one Co-operative Credit Society.

Section III

AGRICULTURAL ORGANISATIONS

(a) *Taluka Development Association.*—During the year, the total number of Taluka Development Associations was 15. The work has been continued on the usual lines reported in the previous year's report. Some of the associations have now been found to be helping the department in undertaking higher responsibilities of managing classes. Satara Taluka Development Association organised and managed a class of fruit growing; Walva (Islampur) Taluka Development Association organised and managed a Land Development and Plow Class. In September 1929, the Hon'ble Minister Mr. B. V. Jadhav paid a visit to a couple of Taluka Development Associations in Satara District and expressed satisfaction. The work put in by all Associations except the Junnar Association was to the mark.

(b) *Non-Credit Societies.*—The following statement will show the work done in the year by the Non-Credit Societies which have been working. The rest of the non-credit societies have not developed work as yet.

Name of Society	Value of produce sold
“A”—Sale Societies—	
	Rs.
(1) Haveli Taluka Agricultural Sale Society ..	2,62,425
(2) Barsi Taluka Agricultural Sale Society, Barsi ..	9,172
(3) Kurduwadi Purchase and Sale Union, Kurduwadi ..	56,300
(4) Nira Canals Societies, Purchase and Sale Union, Baramati	2,82,894
(5) The Warna Valley Co-operative Sale Union, Ltd., Islampur	1,67,841

" B "—Manure Societies—

Name of Society	Value of manure purchased and distributed
	Rs.
(1) Retre Harnax Society (District Satara)	.. 990
(2) Peth Group (District Satara)	.. 469

" C "—Machinery and Implement Societies—

	Hire recovered
	Rs.
(1) Haveli Taluka Agricultural Machinery Society	.. 1,613
(2) Pathardi Implements Society	.. 1,104
(3) Shevgaon Implements Society	.. 620
(4) Jamkhed Implements Society	.. 583
(5) Madha Taluka Implements Society	.. 182
(6) Tadavale Implements Society	.. 236
(7) Pandharpur Taluka Implements Society	.. 36
(8) Kapuskhed Implements Society	.. 146

The Haveli Taluka Co-operative Agricultural Machinery and Implement Society, Ltd., Nanded.—This society is registered only in November 1929. It has started with installing and working a Power Crusher run by oil-engine. With the installation of this power crusher at Nanded, which apparently is a great success, there is a likelihood of more crushers installed on this side in the near future.

Section IV

Agricultural Services

The services under this head can be mentioned in the following form :—

Section IV-A

Boring Operations.—In the year under report, five boring machines were working. Out of these, four worked for the full year and one had to be stopped for two months at the end of the year owing to want of funds. There were no demands from the Nagar District for boring as the past three seasons were good. The machines thus worked in the three districts, Sholapur, Poona and Satara. The total number of new bores were 47 and five of the last year were completed. Thus the total number was 52, out of which three were on hand incomplete, one was experimental and one was abandoned. This left 47 and out of these 26 were successful and 21 unsuccessful. The percentage of success came to 55·3 per cent. The total footage bored by the above machines was 5,620'·6" as against 4,615'·6" of the last year. The average number of working days of each machine was 188·6 as against 174·2.

The details of the working of these machines are tabulated below :—

STATEMENT OF BORES FOR 1929-30

Statement showing the details of

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of bore
1	2	3	4	5	6	7
<i>Poona District</i>						
1	The Agri. Engineer	.. ..	Haveli	Poona	Surface	4"
2	Mr. V. N. Kulkarni	.. ..	Khed	Khed	Do.	4"
3	„ H. G. Deo	.. ..	Haveli	Aundh	Do.	4"
4	„ G. D. Khole	.. ..	Do.	Do.	Well 18' x 35'	4"
5	„ B. Y. Patil	.. ..	Do.	Do.	Surface	4"
6	„ K. B. Sathe	.. ..	Do.	Poona	Do.	4"
7	„ B. M. Shinde	.. ..	Peta Shirur	Talegaon (Dhamdhare)	Do.	4"
8	„ M. V. Bhide	.. ..	Haveli	Poona	Do.	4"
9	„ S. V. Bhide	.. ..	Do.	Do.	Do.	4"
10	„ B. N. Gujar	.. ..	Peta Shirur	Talegaon (Dhamdhare)	Do.	4"
11	„ P. L. Marvadi	.. ..	Do.	Do.	Do.	4"
12	„ B. S. Patil	.. ..	Haveli	Aundh	Do.	4"
13	„ H. S. Gujar	.. ..	Peta Shirur	Talegaon (Dhamdhare)	Do.	4"
14	Do.	.. ..	Do.	Do.	Do.	4"
15	Mr. U. H. Koyalkar	.. ..	Khed	Koyali	Do.	4"
16	Do.	.. ..	Do.	Do.	Well 22' x 32'	4"
17	Mr. B. V. Gujar	.. ..	Peta Shirur	Talegaon (Dhamdhare)	Surface	3"
18	„ P. G. Chambhar	.. ..	Do.	Do.	Do.	3"
19	„ B. J. Chambhar	.. ..	Do.	Do.	Well 25' x 28"	3"
20	„ H. C. Marvadi	.. ..	Do.	Do.	Surface	4"
21	„ K. S. Marvadi	.. ..	Khed	Solu	Do.	4"
<i>Sholapur District</i>						
22	Sub-Divisional Officer, P. W. D.	.. ..	Madha	Madha	Surface	4"
23	Do. do.	.. ..	Do.	Mohol	Do.	4"

bores taken during the year 1929-30

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	Number of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, carting, castings, cutting shoe, etc.	Departmental charges for the well owner	Average Departmental expenses on the bore in
8	9	10	11	12	13	14	Supervision and Depreciation charges 15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
43'-0"	NH.	....	....	....	....	....	2 9 3
250'-0"	NH.	Dry	NH.	192 0 0	267 6 0	NH.	93 12 0
103'-4"	NH.	80	80	43 4 0	47 12 0	NH.	38 9 0
74'-0"	NH.	10	10	75 0 0	74 8 0	NH.	27 12 0
130'-0"	NH.	300	300	110 12 6	48 0 9	170 0 0	67 10 0
132'-0"	NH.	100	100	98 0 0	117 8 0	NH.	67 0 0
118'-0"	NH.	Dry	NH.	71 5 0	182 7 6	16 0 0	48 10 0
150'-0"	NH.	40	40	110 1 9	82 11 0	NH.	71 12 0
200'-0"	NH.	25	25	98 10 0	125 9 9	NH.	78 2 0
110'-0"	NH.	520	520	35 0 0	75 12 0	140 0 0	42 15 6
104'-0"	NH.	300	300	30 0 0	85 8 0	131 0 0	40 10 0
123'-0"	NH.	320	320	72 1 6	158 4 0	159 8 0	48 0 9
54'-0"	NH.	NH.	NH.	81 0 0	90 0 6	NH.	21 1 9
93'-0"	NH.	520	520	36 10 3	130 7 0	114 8 0	36 9 3
100'-0"	NH.	520	520	87 0 0	110 4 0	125 0 0	39 1 0
45'-0"	50	190	140	35 0 0	70 9 0	2 0 0	17 9 3
85'-0"	NH.	520	520	34 10 0	104 2 0	102 8 0	53 1 0
73'-0"	NH.	520	520	35 0 0	95 8 0	84 8 0	27 6 0
51'-0"	100	700	600	42 0 0	84 12 0	51 8 0	19 14 9
135'-0"	NH.	Dry	NH.	105 0 0	135 12 0	2 0 0	60 8 9
75'-0"	NH.	20	20	75 0 0	90 8 0	NH.	29 4 9
96'-0"	NH.	320	320	} Not known. }		119 0 0	8 9 6
73'-0"	NH.	310	310			95 8 0	26 7 0

Statement showing the details of bores

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well.	Average Departmental expenses on the bore in
						Running expenses, mechanic's wages and repairs
1	2	3	4	5	6	16
<i>Poona District</i>						
1	The Agri. Engineer	.. ..	Haveli	Poona	Surface	Rs. a. p. 8 6 0
2	Mr. V. N. Kulkarni	.. ..	Khed	Khed	Do.	458 12 0
3	„ H. G. Deo	.. ..	Haveli	Aundh	Do.	141 0 0
4	„ G. D. Khole	.. ..	Do.	Do.	Well 18' x 35'	74 0 0
5	„ B. Y. Patil	.. ..	Do.	Do.	Surface	207 12 0
6	„ K. B. Sathe	.. ..	Do.	Poona	Do.	207 13 0
7	„ B. M. Shinde	.. ..	Peta Shirur	Talegaon (Dhamdhare).	Do.	151 12 0
8	„ M. V. Bhide	.. ..	Haveli	Poona	Do.	206 4 0
9	„ S. V. Bhide	.. ..	Do.	Do.	Do.	281 4 0
10	„ B. N. Gujar	.. ..	Peta Shirur	Talegaon (Dhamdhare).	Do.	154 11 0
11	„ P. L. Marvadi	.. ..	Do.	Do.	Do.	146 4 0
12	„ B. S. Patil	.. ..	Haveli	Aundh	Do.	172 15 6
13	„ H. S. Gujar	.. ..	Peta Shirur	Talegaon (Dhamdhare).	Do.	75 15 4
14	Do.	.. ..	Do.	Do.	Do.	130 12 6
15	Mr. U. H. Koyalikar	.. ..	Khed	Koyali	Do.	140 10 0
16	Do.	.. ..	Do.	Do.	Well 22' x 32'	63 4 6
17	Mr. B. V. Gujar	.. ..	Peta Shirur	Talegaon (Dhamdhare).	Surface	119 8 6
18	„ P. G. Chambhar	.. ..	Do.	Do.	Do.	72 10 6
19	„ B. J. Chambhar	.. ..	Do.	Do.	Well 25' x 28'	71 11 6
20	„ H. C. Marvadi	.. ..	Do.	Do.	Surface	218 0 0
21	„ K. S. Marvadi	.. ..	Khed	Solu	Do.	105 7 6
<i>Sholapur District</i>						
22	Sub-Divisional Officer, P. W. D.	.. ..	Madha	Madha	Surface	30 15 0
23	Do. do.	.. ..	Do.	Mohol	Do.	72 10 4

taken during the year 1929-30—contd.

Cost of bore to the well owner	Cost per foot for the well owner	Total cost of bore inclusive of well owner's	Total cost per foot	Object of boring, i.e., agriculture or drinking	Remarks, i.e., successful, unsuccessful, incomplete, on hand or abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
Nd.	Nd.	10 15 3	1 5 11	Experiment and sand line arrangements.	Completed this year. Previous work done 35 feet.
459 6 0	1 13 5	1,011 14 0	4 1 6	Drinking	Completed this year. Previous work done 57 feet.
91 0 0	0 14 2	270 9 0	2 10 3	Do.	Unsuccessful.
149 8 0	2 3 11	251 4 0	3 6 3	Agriculture	Do.
328 13 3	2 3 6	604 3 3	5 13 9	Drinking	Successful.
215 8 0	1 10 2	490 5 0	3 11 6	Do.	Unsuccessful.
269 12 6	2 4 7	469 7 6	3 15 3	Do.	Do.
192 12 0	1 4 7	470 12 0	3 2 3	Do.	Do.
224 3 9	1 2 0	533 9 9	2 14 9	Do.	Do.
250 12 0	2 5 5	448 6 6	4 1 3	Do.	Successful.
246 8 0	2 1 6	433 6 6	4 2 9	Do.	Do.
389 13 0	3 2 9	610 13 3	4 15 3	Do.	Do.
180 0 0	3 5 0	277 1 9	5 2 3	Do.	Abandoned.
281 9 3	3 1 0	448 15 0	4 13 0	Do.	Successful.
322 4 0	3 3 6	501 15 0	5 1 3	Do.	Do.
197 9 0	2 6 3	188 6 9	4 2 1	Agriculture	Unsuccessful.
241 4 0	2 13 6	513 13 6	6 0 2	Drinking	Successful.
215 0 0	2 14 0	315 0 6	4 5 0	Do.	Do.
178 4 0	3 7 3	269 14 3	5 4 1	Agriculture	Do.
242 12 0	1 9 0	521 4 0	3 5 9	Drinking	Unsuccessful.
165 8 0	2 3 3	300 3 6	4 0 1	Do.	Do.
....	....	....	....	Drinking	Completed this year. Previous work done 74 feet. Successful.
....	....	....	....	Do.	Successful.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of bore
1	2	3	4	5	6	7
<i>Sholapur District—contd.</i>						
24	Mr. G. D. Sathe	.. ..	Madha	.. Madha	.. Surface	4"
25	.. A. A. Changbhole	.. ..	Do.	.. Dò.	.. Do.	4"
26	.. A. B. Karjkar	.. ..	Do.	.. Do.	.. Do.	4"
27	.. D. K. Mandve	.. ..	Do.	.. Mohol	.. Well 28' × 38'	4"
28	.. V. D. Dalvi	.. ..	Do.	.. Pokhrapur	.. Well 24' × 35'	4"
29	.. S. B. Vaghmode	.. ..	Do.	.. Kolegaon	.. Well 22' × 30'	4"
<i>Satara District</i>						
30	Miss B. D. Yadao	.. ..	Satara	.. Khed	.. Surface	4"
31	Mr. D. R. Dalvi	.. ..	Valva	.. Nava-Khed	.. Do.	4"
32	.. R. K. Nalvade	.. ..	Satara	.. Vadha	.. Do.	4"
33	The President, Ashta Municipality.	.. ..	Valva	.. Ashta	.. Do.	4"
34	Do. do.	.. ..	Do.	.. Do.	.. Do.	4"
35	Do. do.	.. ..	Do.	.. Do.	.. Do.	4"
36	Do. do.	.. ..	Do.	.. Do.	.. Do.	4"
37	The Medical Officer	.. ..	Wai	.. Wai	.. Do.	4"
38	Do.	.. ..	Do.	.. Do.	.. Do.	4"
39	Mr. N. H. Harshe	.. ..	Valva	.. Aitavda (Budruk).	.. Do.	4"
40	.. A. K. Patil	.. ..	Do.	.. Do.	.. Do.	4"
41	Do.	.. ..	Do.	.. Do.	.. Well 15' × 25"	4"
42	Mr. B. K. Vangyani	.. ..	Do.	.. Ashta	.. Surface	4"
43	.. N. B. Patil	.. ..	Do.	.. Aitavda (Budruk).	.. Do.	4"
44	.. R. K. Chendke	.. ..	Do.	.. Do.	.. Do.	4"

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	Number of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, castings, cutting shoe, etc.	Departmental charges for the well owner	Average Departmental expenses on the bore in
							Supervision and Depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
48'-0"	NH.	250	250	45 0 0	81 0 0	48 0 0	18 12 0
105'-0"	NH.	300	300	115 12 0	76 0 0	182 8 0	41 0 3
80'-0"	NH.	310	310	82 11 0	71 5 0	108 8 0	35 0 3
118'-0"	150	NH.	NH.	120 0 0	188 10 0	NH.	48 10 0
100'-0"	300	900	600	71 8 0	100 14 0	125 0 0	30 1 0
107'-0"	....	....	....	....	....	....	....
150'-0"	NH.	NH.	NH.	48 0 0	35 0 0	NH.	71 12 0
160'-0"	NH.	250	250	55 0 0	81 4 3	215 0 0	62 8 9
78'-0"	NH.	250	250	28 0 0	119 9 0	84 8 0	26 7 0
152'-0"	NH.	520	520	508 7 0	914 8 9	208 0 0	295 11 8
200'-0"	NH.	520	520			275 0 0	
201'-0"	NH.	520	520			276 8 0	
204'-0"	NH.	520	520			281 0 0	
85'-0"	NH.	35	35	41 2 0	118 0 0	NH.	38 8 0
205'-0"	NH.	35	35	104 14 0	362 14 0	NH.	80 6 0
90'-0"	NH.	310	310	45 0 0	111 0 0	110 0 0	35 6 9
110'-0"	NH.	125	125	20 0 0	85 0 0	NH.	42 15 6
72'-0"	NH.	....	....	110 0 0	125 0 0	NH.	26 0 6
210'-0"	NH.	520	520	105 0 0	201 4 0	290 0 0	82 4 8
127'-0"	NH.	100	100	80 0 0	90 12 0	NH.	52 2 3
125'-0"	NH.	30	30	90 9 0	90 14 0	NH.	51 6 0

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Average Departmental expenses on the bore in
						Running expenses, mechanic's wages and repairs
1	2	3	4	5	6	16
	<i>Sholapur District—contd.</i>					Rs. a. p.
24	Mt. G. D. Sathe .. ..	.. ..	Madha ..	Madha ..	Surface ..	67 8 0
25	„ A. A. Changbhole .. ..	.. ..	Do. ..	Do. ..	Do. ..	140 10 6
26	„ A. B. Karjkar .. ..	.. ..	Do. ..	Do. ..	Do. ..	125 11 6
27	„ D. K. Mandve .. ..	.. ..	Do. ..	Mohol ..	Well 28' x 38' ..	151 12 0
28	„ V. D. Dalvi .. ..	.. ..	Do. ..	Pokhrapur ..	Well 24' x 35' ..	140 10 0
29	„ S. B. Vaghmode .. ..	.. ..	Do. ..	Kolegaon ..	Well 22' x 30' ..	.....
	<i>Satara District</i>					
30	Miss B. D. Yadao .. ..	.. ..	Satara ..	Khed ..	Surface ..	206 4 0
31	Mr. D. R. Dalvi .. ..	.. ..	Valva ..	Nava-Khed ..	Do. ..	223 14 6
32	„ R. K. Nalvade .. ..	.. ..	Satara ..	Vadha ..	Do. ..	72 10 8
33	The President, Ashta Municipality. .. ..	.. ..	Valva ..	Ashta ..	Do. ..	1,064 8 6
34	Do. do. .. ..	.. ..	Do. ..	Do. ..	Do. ..	
35	Do. do. .. ..	.. ..	Do. ..	Do. ..	Do. ..	
36	Do. do. .. ..	.. ..	Do. ..	Do. ..	Do. ..	
37	The Medical Officer .. ..	.. ..	Wai ..	Wai ..	Do. ..	123 5 3
38	Do. .. ..	.. ..	Do. ..	Do. ..	Do. ..	286 4 0
39	Mr. N. H. Harshe .. ..	.. ..	Valva ..	Aitavda (Budruk). ..	Do. ..	127 1 9
40	„ A. K. Patil .. ..	.. ..	Do. ..	Do. ..	Do. ..	154 11 0
41	Do. .. ..	.. ..	Do. ..	Do. ..	Well 15' x 25' ..	71 4 0
42	Mr. B. K. Vangyani .. ..	.. ..	Do. ..	Ashta ..	Surface ..	292 8 3
43	„ N. B. Patil .. ..	.. ..	Do. ..	Aitavda (Budruk). ..	Do. ..	164 2 0
44	„ R. K. Chendke .. ..	.. ..	Do. ..	Do. ..	Do. ..	161 10 0

Cost of bore to the well owner	Cost per foot for the well owner	Total cost of bore inclusive of well owner's	Total cost per foot	Object of boring, i.e., agriculture or drinking	Remarks, i.e., successful, unsuccessful, incomplete, on hand or abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
174 0 0	3 10 0	260 4 0	5 6 1	Drinking ..	Successful.
324 4 0	3 1 3	505 14 9	4 12 2	Do. ..	Do.
262 8 0	3 15 0	423 3 9	4 13 3	Do. ..	Do.
258 10 0	2 12 9	459 0 0	3 14 2	Agriculture ..	Unsuccessful.
297 6 0	2 15 9	477 1 0	4 12 0	Do. ..	Successful.
....	....	....	....	Do. ...	In hand.
83 0 0	0 8 9	261 0 0	1 11 2	Drinking ..	Unsuccessful. Completed this year. Previous work done 105 feet.
351 4 2	2 3 0	637 11 6	3 15 9	Do. ..	Successful. Completed this year. Previous work done 50 feet.
232 1 0	3 2 9	332 2 3	4 2 3	Do. ..	Successful.
				Do. ..	Do.
				Do. ..	Do.
2,458 7 9	3 3 9	3,818 11 6	5 0 9	Do. ..	Do.
				Do. ..	Do.
159 2 0	1 14 0	315 15 3	3 11 2	Agriculture ..	Unsuccessful.
557 12 0	2 11 6	906 6 0	4 6 9	Do. ..	Do.
266 0 0	2 15 0	428 8 6	4 12 1	Drinking ..	Successful.
105 0 0	0 15 0	302 10 6	2 12 0	Do. ..	Unsuccessful.
225 0 0	3 2 0	322 4 6	4 7 3	Do. ..	Not yet decided.
596 4 0	2 13 6	971 0 6	4 9 9	Do. ..	Successful.
172 12 0	1 6 3	396 0 3	3 1 1	Do. ..	Unsuccessful.
181 7 0	1 7 0	394 7 0	3 1 3	Do. ..	Do.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of bore
1	2	3	4	5	6	7
<i>Salara District—contd.</i>						
45	Mr. M. D. Mahajan	..	Valva	Ashta	Surface	4"
46	Do.	..	Do.	Do.	Do.	4"
47	Mr. N. G. Kalantre	..	Do.	Attavda (Badruk).	Do.	4"
48	„ V. R. Kulkarni	..	Do.	Do.	Do.	4"
49	„ S. L. Sutar	..	Do.	Ashta	Do.	4"
50	„ R. B. Patil	..	Do.	Attavda (Badruk).	Do.	4"
51	„ T. B. Avti	..	Do.	Ashta	Do.	4"
52	„ G. B. Deshmukh	..	Do.	Do.	Do.	4"

Depth actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	Number of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, casing, cutting shoe, etc.	Department- al charges for the well owner	Average Departmental expenses on the bore in
							Supervision and Depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
40'-0"	NH.	Dry	Dry	37 8 0	55 14 0	NH.	15 10 0
140'-0"	NH.	520	520	100 0 0	130 0 0	194 0 0	57 0 6
90'-0"	NH.	40	40	60 0 0	4 80 0 0	NH.	35 6 9
80'-0"	NH.	25	25	101 14 0	99 9 0	NH.	35 0 3
70'-0"	NH.	520	520	40 0 0	60 0 0	80 0 0	27 5 6
81'-0"	NH.	100	100	48 2 8	56 0 0	NH.	32 13 0
100'-0"	NH.	520	520	98 2 8	243 6 0	215 0 0	62 8 9
94'-0"	NH.			....	....	....	....

Serial No.	Name of wellowner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Average Departmental expenses on the bore in
						Running expenses, mechanic's wages and repairs
1	2	3	4	5	6	16
	<i>Satara District—contd.</i>					Rs. a. p.
45	Mr. N. D. Mahajan	..	Valva	Ashta	Surface	55 9 0
46	Do.	..	Do.	Do.	Do.	204 8 0
47	Mr. N. G. Kalantre	..	Do.	Aitavda (Budruk).	Do.	127 1 0
48	„ V. R. Kulkarni	..	Do.	Do.	Do.	125 11 6
49	„ S. L. Satar	..	Do.	Ashta	Do.	98 7 0
50	„ R. B. Patil	..	Do.	Aitavda (Budruk).	Do.	118 2 0
51	„ T. B. Avti	..	Do.	Ashta	Do.	223 14 6
52	„ G. B. Deshmukh	..	Do.	Do.	Do.	..

Cost of bore to the well owner	Cost per foot for the well owner	Total cost of bore inclusive of well owner's	Total cost per foot	Object of boring, i.e., agriculture or drinking	Remarks, i.e., successful, unsuccessful, incomplete, on hand or abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
98 6 0	2 5 3	184 9 0	4 1 7	Drinking	Accident. (Abandoned.)
424 0 0	5 1 0	685 8 6	4 11 2	Do.	Successful.
140 6 0	1 9 0	302 14 6	3 5 8	Do.	Unsuccessful.
200 14 0	2 4 0	361 9 6	4 1 0	Do.	Do.
186 0 0	2 10 6	312 12 6	4 7 3	Do.	Successful.
104 2 6	1 3 0	222 4 6	2 10 4	Do.	Unsuccessful.
556 4 3	3 7 0	849 5 9	5 3 0	Do.	Successful.
					In hand.

Section IV-B

Engineering Advice and Assistance.—As reported in last year's report the demand on the Mechanical Assistant's services is gradually increasing and as he and his assistant could not cope with the installations of several plants in time, special assistant was asked for, for a period of 3½ months and the Agricultural Engineer was kind enough to spare a man for this Division. The following summary shows the work done during the year:—

(a) *Erection of New Plants and Machinery*:—

- (1) 18 B.H.P. hot start, National Crude Oil Engine with 3" Gwynnes centrifugal pump; 2 flour mills with a 2½" counter-shaft. (Belapur, District Ahmednagar).
- (2) 15 B.H.P. cold start "S.I." type Blackstone Crude Engine with a 45" Chattanooga mill and 2 flour mills (Survad, post Bavada, Taluka Indapur).
- (3) 22 B.H.P. cold start, Ruston Hornsby, 4 H. type crude oil engine with 92 Chattanooga mill (Co-operative Agricultural Implement Society, Nanded, Taluka Haveli, Poona District).
- (4) 5 B.H.P. Petter "S" type vertical engine with a 3" × 4" Pulsometer centrifugal pump (Survad, Taluka Indapur, District Poona).
- (5) 5 B.H.P. Petter "S" type crude oil engine with aquatole (Desundi, near Rahuri, District Ahmednagar).
- (6) 8 B.H.P. Petter (cold start) "S" type vertical crude oil engine with 3" × 4" pulsometer pump (Mhaswad, Taluka Man, District Satara).
- (7) 12½ B.H.P. "3 M type" Ruston Hornsby Crude Oil Engine with 3" pulsometer pump, huller and a rotary oil mill (Dhom, Taluka Wai, District Satara).

(b) *Preparation of estimates and advice.*—He prepared 37 estimates for power cane mills, tractor, pumps and oil-engines out of which five were for tagai loan.

In addition to this, his services were spared for the Kolhapur State for organising the machinery section at the agricultural show held at Kolhapur.

The Government power plants at Manjri, Kopergaon and Loni, Hanthurna, etc., were also looked after by him.

Section IV-C

Pig killing campaigns.—As reported in last year's report, the work is getting popular wherever the remedy is proved to be effective and as a result, during the year 1929-30, the following amounts were collected in different groups with the help of a Shikari lent for helping the Panch Committees for collection except at Mungi:—

Serial No.	Name of group	Amount collected
		Rs.
(1)	Palsi group committee (Satara District)	189
(2)	Godavari Canals	1,000
(3)	Mungi group committee	175
(4)	The Sinhagad group committee ..	200

The work done is summarised in the following statement :—

Statement showing results of anti-pig campaigns in the South Central Division during 1929-30

Serial No. of campaign	Tracts worked	Period of campaign	Pigs killed	Cost of the work	Cost per animal killed
1	Palshi group, Koregaon (Satara).	July and August.	24 10 sows.	Rs. a. p. 88 4 0	Rs. a. p. 3 12 0
2	Godawari left and right bank canals.	September	26 13 sows.	300 0 0	11 8 7
3	Palshi group.	October	18 5 sows.	75 0 0	5 12 3
4	Mungi group, Shevgaon (Ahmednagar).	December and January.	21 pigs 8 buck. 8 sows.	163 9 6	5 10 3.
5	Godawari Canals	March and April.	104 51 sows.	595 12 0	5 11 7
6	Sinhagad group (12 villages).	May and June	33 10 sows.	75 11 0	2 4 9
7	Palshi group.	June	19 7 sows.	63 0 0	3 6 0
Total			240 8 104 pigs. buck. sows.	1,360 8 3	5 8 0

Serial No. of campaign	Tracts worked	Area of crop protected	Cost per acre of crop protected	Remarks
1	Palshi group, Koregaon (Satara).	500 acres groundnut. 15 days protection (of seed sown).	Rs. a. p. 0 2 8	Poona guns. and local beaters.
2	Godawari left and right bank canals.	472 acres adsali cane.	0 10 0	Work in the gestation period of the pig. Thirteen sows contained 105 babies in womb.
3	Palshi group	500 acres groundnut 1½ months protection of pods.	0 2 2	Poona guns and Mang beaters and dogs gang from Fadali.
4	Mungi group, Shevgaon (Ahmednagar).	4,000 acres wheat, gram and rabi (two months jowar.	0 0 8 (two months watching).	Four days' work Poona guns and local "chihhalhari" beaters and dogs gang and rest two guns and village beaters.
5	Godawari Canals	4,132 acres cane	0 2 3	Six Poona guns and local vaidu beaters and dogs gang.
6	Sinhagad group (12 villages).	Summer campaign to ensure protection of rice seedlings.	.....	Six Poona guns and a batch of local beaters from among the farmers.
7	Palshi group	Additional campaign before rains.	.....	Four Poona guns and Mang beaters and dogs.

As a result of publication of this work in the *Times of India* two years back one of the enthusiastic cultivators, Mr. D. M. Damle of Wun (Berar, C. P.) undertook the campaign work with the advice of the Pig Officer and his report about the work done there would show the success attained.

Extract from letter of Mr. D. M. Damle, dated 9th July 1930, to the Deputy Director of Agriculture, S. C. D., Poona :—

“ The campaign was conducted in scrub forest of 2,350 acres with a trained shikari under my supervision. We succeeded in actually killing 227 animals in 12 weeks and with the number that died with injury outside and utilised by villagers, the total would come to 280. The cost of actual killed animals comes to Rs. $\frac{550}{227}$ = Rs. 2 per kill. This cost could have been still reduced by better organising the sale of carcuses. I had entered into an agreement with Government undertaking payment of forest guards, giving half the number of Chital skins and heads and other skins. Government did not go out of pocket ; on the contrary, they got half (45) Chital skins and heads.”

Section IV-D

Field embankments.—The Bunding Officer toured for 197 days and visited 53 villages for the land development work. There has been a keen demand on his services and the following statement shows the applications received from private individuals and through Revenue Officers and the applications disposed off during the year :—

Serial No.	Name of the district	Total No. of applications received from		Total No. of applications disposed of	
		Revenue	Private	Revenue	Private
1	Poona	7	14	7	1
2	Sholapur	15	37	6	14
3	Satara	5	7	..	3
4	Ahmednagar	7	13	2	..
	Total ..	34	71	15	18

In addition to these applications preliminary surveys of 21 more schemes have been completed.

Besides this regular work, he helped to organise a Land Development Court at Kolhapur Agricultural Show and at Khed Shivapur Show in Poona District organised by the Deccan Agricultural Association, Poona. He conducted and managed with the help of the Taluka Development Association, Walva, a Land Development Class held at Islampur which is fully described under section (h) (i).

Section V

Agricultural Education.—As reported in last year's report the scholarships have been reduced to Rs. 8 and Rs. 5. In spite of this, 73

applications were received ; out of which 22 students were selected. The number of boys in the school in two years stood as under :—

Rate of Scholarship	Number of students	
	1st year	2nd year
Rs. 8	4	7
Rs. 5	17	7
Paid	1	1

The following statement shows the results of the examination :—

Year	No. of boys	No. of boys appeared for examination	No. of boys passing the examination
1st year	22	22	21
2nd year	18	18	18

The expenses of the year amounted to Rs. 12,263-4-8 as against Rs. 12,542-8-5 and the receipts Rs. 2,404-4-3 against Rs. 1,862-0-3.

During the year, five teachers were deputed from Sholapur, Belgaum and West Khandesh districts by the educational department and these were trained for agricultural bias classes. All were successful in the examination.

There are 18 agricultural bias classes in this Division. The district staff rendered every possible help to these classes by arranging cropping schemes, examining boys, etc., so far they could do and the travelling allowance grant permitted.

The Hon. Minister for Agriculture, Mr. B. V. Jadhav, M.A., LL.B., visited the school twice during the year and his remarks are as under :—

“The Poultry section is well managed and ought to be further developed. The other sections too appear to do well.”

Section VI

Co-ordination of revenue, irrigation and agricultural officers.—Hearty co-operation was received from both the departments without which the shows and demonstration work described above could not have been possible.

Divisional Board of Agriculture.—The chairmanship of the Divisional Board was transferred to me from 1st November 1929 and since then the board had three meetings.

Miscellaneous.—The staff of this Division has contributed their full quota in supplying material to the Shetki Shetkari and Agricultural College Magazine.

With the increased activities, the staff in this division has tried to do their best with a very few exceptions.

(Signed) B. P. VAGHOLKAR,

Deputy Director of Agriculture,
South Central Division, Poona.

APPENDIX E

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF
AGRICULTURE, SOUTHERN DIVISION, DHARWAR, FOR THE
YEAR 1929-30

(1) I held charge of the office of the Deputy Director of Agriculture, Southern Division, throughout the year. Messrs. Kottur and Shevade continued as Cotton Breeder and Cotton Superintendent. There was no material change in the subordinate staff. The services of two acting graduate assistants were dispensed with. The post of graduate assistant that was transferred to the Agricultural College last year, was restored to the Southern Division.

Season

(2) Good anti-monsoon and early monsoon rains opened the kharif season with very bright prospects in Mallad and Gadinad. Lands were prepared and crops were sown in time. In Yerinad these rains were scanty as usual and kharif crops could not be sown in many places. From the middle of July to the middle of September there was a long, continuous break, all over the Division and kharif crops suffered badly in Mallad and Gadinad and practically withered in Yerinad. Cotton sowing was delayed and the crop suffered from continuous, easterly winds further. Rabi rains on the whole were good and they considerably improved the situation. The yields of kharif crops and cotton were poor in general, whereas those of rabi crops approximated to normal. The prices of food grains, cotton and groundnut considerably fell down during the year and the economic position of the cultivator has gone from bad to worse. The supply of fodder was inadequate in certain parts but that of drinking water was good.

(3) The work done by different sections is summarised under the same heads as it was done in previous years to facilitate reference and comparison where needed, viz. :—

- (a) Research and Experiments,
- (b) Propaganda,
- (c) Organisation,
- (d) Direct services to the public,
- (e) Agricultural Education, and
- (f) General.

(a) Research and Experiments

(4) *Dharwar Farm*.—Plant breeding work on cotton which is the chief money crop of the Division continued to receive the usual close attention. Dharwar No. 1 $\times$ Rosea cross strain No. 15 again gave higher yield than Dharwar No. 1. Strain No. 14 was found to be late and yielded less than Dharwar No. 1.

(5) Breeding wilt resistant types of cotton continued to receive much attention. Dharwar No. 1 $\times$ Dharwar No. 2 cross was compared on a large scale with Dharwar No. 1 in a badly wilt-affected plot. Dharwar

No. 1 $\times$ Dharwar No. 2 gave 687 lbs. yield per acre against 176 lbs. of Dharwar No. 1 and the percentage of wilt was 1.5 against 81.1. The difference was very marked. Experiments conducted in cultivators' fields also showed similar results and the cotton Dharwar No. 1 $\times$ Dharwar No. 2 was named as "Jayawant" cotton, meaning "Triumph." The name was first declared in the auction sale of Hubli Cotton Sale Society where it fetched better prices than Dharwar No. 1 cotton, and it was decided that this cross should take the place of Dharwar No. 1 cotton in the Hubli area. In spinning tests also it has headed the list giving 38 counts against 36 of Dharwar No. 1.

Dharwar No. 1 $\times$ Wagale cross, strain No. 6, has been found to be another promising wilt-resistant cotton. It is as good as Jayawant in yield and wilt-resistance and has better colour and ginning percentage. It was sent for spinning test for the first time and has given 34 counts. This cotton will be maintained as a reserve material. The cross Kumpta wilt-resistant $\times$ (Dharwar No. 1 $\times$ Rosea No. 15) referred to in paragraph 5 of the last year's report, has yielded one desirable strain No. 2-2 which is white in colour with a ginning percentage of 29. The cotton of this will be sent for spinning test before taking yield-tests next season. The cross Dharwar No. 2 $\times$ (Dharwar No. 1 $\times$ Rosea No. 15) which is intended to replace the wilt susceptible Dharwar No. 1 $\times$ Rosea cross No. 15, is still under study. It has not given as high yielding strains as Dharwar No. 1 $\times$ Rosea cross No. 15.

(6) Dharwar No. 1 $\times$ Tashkant, Dharwar No. 1 $\times$ Sangwinium and Dharwar No. 1 $\times$ Wagi crosses were discontinued; being found unpromising. Jayawant $\times$ Wagi and Kumpta wilt resistant $\times$ Tashkant have been further selected; but there is nothing worth specially mentioning for the year.

(7) Selfing and multiplication of the seed of various varieties introduced into the Districts of the Southern Division, continued on Dharwar Farm. With a view to replace Dharwar No. 1 entirely by Jayawant, 160 lbs. seed of the latter has been selfed during the year and this will suffice for dibbling the whole cotton area of 30 acres on the farm. 15 lbs. Dharwar No. 1 cotton seed has been selfed with the object of using it in check plots and for comparative spinning tests. 20 lbs. of Dharwar No. 1 $\times$ Rosea No. 15 and 40 lbs. of Gadag No. 1 seeds have been selfed for multiplication on the Farm as usual and are intended for Bailhongal and Gadag tracts, respectively.

(8) The work of breeding American cottons was retransferred to the Cotton Breeder by the Cotton Mycologist according to the decision of the Indian Central Cotton Committee during the year under report. The cross made between Gadag No. 1 $\times$ Sea Island showed splitting. The material was thoroughly examined and fresh selections were made. The selections made for resistance to red leaf disease and referred to in paragraph 9 of the last year's report, resisted this disease far better than Gadag No. 1 and yielded well. Comparative trials of this cotton will be taken during the next season.

(9) As some complaints were received regarding defective germination of the seed, stocked by various societies in the District, 80 samples were tested on Dharwar Farm. In 65 cases out of 80, percentage of germination was found to be above 70. In the remaining 15 cases where the percentage of germination was below 70, the seed was either damaged by rain or contained immature seed. It has been decided that every lot of seed stocked by the Cotton Sale Societies should be tested before distribution.

(10) Jowar breeding work was stopped last year but selected strains of Fulgar white, Fulgar yellow, Bilichagan, Nandyal and Savaner were continued to be maintained and small quantities were distributed to the cultivators who demanded the same.

In groundnut, Spanish peanut variety, strain No. 5, gave better yield than strain No. 10-4 and will continue to be distributed on a large scale. All the area under groundnut on Dharwar Farm will be sown with this strain No. 5.

(11) The other important experiments conducted on Dharwar Farm under the guidance of the Superintendent, are summarised below :—

Crop Experiments.—Comparative trial of five tobacco varieties, viz., Nipani, Nadiad No. 6, Pusa No. 28, Adcock and White Barlay, was repeated during the year. The experiment was conducted according to Fisher's method of randomisation. All the varieties suffered from *Cercospora Nicotiana* disease. Nadiad No. 6 did better than others. The experiment will be repeated with only three varieties, viz., Nadiad No. 6, Nipani and Adcock. The Plant Pathologist has not been able to investigate the disease. Treatment of the seedlings with Bordeaux mixture recommended by him was not effective. The yield of jowar crop after tobacco was 2,611 lbs. grain and 3,741 lbs. kadabi per acre, indicating the value of tobacco as a rotation to jowar. If a remedy for the disease is found out, the prospects of tobacco crop in the transition tract seem to be very bright and it needs close attention of the Plant Pathologist. Five varieties of wheat, viz., Pusa Nos. 12 and 8, Pivala kathyas Nos. 103 and 162 and local were compared. Pivala kathyas strain No. 103 gave better yield (587 lbs. grain per acre) than others. Local red glumed variety of wheat gave better yield than white glumed variety. In the trial of rust resistant strains also, Pivala kathyas strain has given better yield than others. Five varieties of cotton, viz., Dharwar No. 1, Dharwar No. 2, Kumpta, Jayawant, and Dharwar No. 1 × Rosea were again compared during the year for yield. The yields obtained were 238 lbs., 708 lbs., 687 lbs., 692 lbs., and 289 lbs., and the percentage of wilt affected plants was 14·6, 3·4, 3·1, 2·7 and 16·7, respectively. Results of Jayawant cotton are very striking and it beats all others in point of net profits. Four jowar varieties, viz., Fulgar yellow, Muddinandyal, Nandyal and Bilichagan were compared according to Fisher's method of randomisation. Muddinandyal did better than the other three. The yield was 1,776 lbs. grain and 3,860 lbs. kadabi per acre.

(12) *Manurial experiments*.—Results of experiments with different quantities of farm-yard manure on jowar crop are again in favour of ten tons per acre. Residual effects on cotton are in favour of 15 tons per acre applied to jowar crop. Results of San green manuring on the whole are as good as those of farm-yard manure. This experiment teaches that where no farm-yard manure is available in sufficient quantity, attempts should be made to bury the San crop in the transition tract once in four years. In artificial manure experiment on jowar, results of this year taken with those of last year, indicate that an application of sulphate of ammonia 14 lbs. N. together with $2\frac{1}{2}$ tons farm-yard manure per acre is best from economic point of view. On cotton also the application of sulphate of ammonia 28 lbs. N. per acre but without any farm-yard manure has given slightly better results than others. Experiments during the coming year, therefore, will be restricted to the sulphate of ammonia.

(13) *Cultural Experiments*.—In spacing experiment on cotton, 4 feet distance between two rows has given better results than either 3 feet or 2 feet. The average results of the past five years go in favour of 3 feet distance. This is the 2nd year of the rotational experiments explained in paragraph 14 of the last year's report and it is too early to draw any remarks. In the seed rate experiment on groundnut, 120 lbs. seed rate per acre gave better results than 100, 80 and 60 lbs. Wheat is sown ordinarily only lengthwise. In order to see whether crosswise sowing with the same seed rate will give higher yields, an experiment was laid out during the year. Results indicate no difference between the two methods. There is a great difference of opinion prevailing about the exact time of sowing Spanish peanut variety of groundnut crop. An experiment, therefore, was laid out during the year to compare the yields of crops sown in the middle of June, end of June, middle of July and end of July. The crop sown in the middle of June gave better yield and net profits than others. The experiment with sieved and unsieved jowar seed did not show any advantages of sieving. The experiment will be repeated. Groundnut pods are usually removed by hand soon after uprooting, when there are heavy rains. The produce gets spoiled and it is sold in semi-wet condition at low rates. In order to get over the rainy season, the American method of stacking groundnut was experimented and was found to be very useful. When stacked according to this method and left for about 6 weeks, the pods can be easily separated by beating the plants over thin bamboo poles. The total cost of stacking, beating and winnowing comes to Rs. 5 per acre against Rs. 9 in the case of plucking pods soon after harvest. Grasshoppers appeared on jowar crop and they were swept by dragging tarred tin sheets. The labour and tar required for operating $73\frac{1}{2}$ acres three times, were recorded and the average cost came to 8 annas per acre. The attack was not very severe. In the small garden on Dharwar farm figs and mangoes continued to receive attention. In all 200 mango grafts were prepared and sold during the year. The mango plants were dusted with sulphur dust against hoppers.

(14) *Gokak Farm*.—Sugarcane continued to be the most paying crop on this Farm and received the best attention. H.M. 544 continued to give higher yield than yellow Mauritius in karl land and gave higher yield than local Pundia in good soil. In seed rate experiment on yellow Mauritius variety the average results of three years are in favour of 15,000 sets per acre. Selection in local maize on the basis of weight of cob and proportion of grain to cob continued. A few strains seem to be promising. Four varieties of tobacco were compared, viz., Nipani, Nadiad No. 6, Adcock and white Barlay. Nadiad No. 6 gave better results than others but none has yielded any profit.

(15) *Manurial experiments*.—Sulphate of ammonia 75 lbs. N. combined with cake 75 N. applied to sugarcane, gave better results than calcium cyanamide 75 lbs. N. combined with cake 75 N. indicating that sulphate of ammonia is a better top-dressing manure than calcium cyanamide. Difference in net profits was Rs. 70 per acre. Three artificial manures, viz., Nitrate of soda, calcium cyanamide and amophos 28 N. per acre with and without farm-yard manure were compared with no artificial plot according to Fisher's randomisation method. Results in both series of experiments are not statistically significant. The experiment will be continued. In the quantitative farm-yard manure experiment on maize, 5 tons per acre gave better results than $7\frac{1}{2}$ tons and 10 tons.

(16) *Cultural experiments*.—Two year rotation experiment on sugarcane completed a cycle of two years during the year under report. Maize with Tur and sugarcane is found to be better than chilly and sugarcane. The three year rotation experiment will complete one cycle next year.

(17) *The orchard and nursery continued to work at a profit*.—Mosambi, santra and limbu trees suffered much from die-back and were removed. The nursery continued to pay more than the orchard itself. In all 6,127 seedlings and grafts were distributed from the nursery. The total expenditure on the garden was Rs. 640 and the income was Rs. 1,159 during the year, showing a net profit of Rs. 519.

(18) *Mugad Rice Breeding Station*.—Four promising strains of Mugad variety, viz., Early No. 161, Inter Nos. 81 and 249 and Late No. 141 and three strains of Antersal, viz., Early No. 67, Inter No. 90 and Late No. 200 were compared with local in replication series and multiplication plots. In both places these strains have done better than local. These will continue to be maintained. Tests in cultivators' fields have also been very encouraging. Considering the results of three years the superiority of all these selected strains over local is more than 20 per cent. in each case and they deserve, therefore, to be introduced into the District on a large scale. The study on the cross Mugad 81 $\times$ Kolumba 39 continued on 100 individual plants in F^5 generation. Seven promising pure lines have been obtained. They will be tested for yielding capacity. Botanical study on Gonag continued.

(19) *Tegur Cattle Breeding Farm*.—The progeny of the cross between local cows and Amrut Mahal bull in its third generation has shown great

improvement. Seventeen bull calves and 12 cow calves were born during the year. The total number of the herd on 31st March 1930 was 139 valued at Rs. 7,193 against 120 valued at Rs. 6,471 last year. Two bull calves were sold during the year for Rs. 200. The cultivators are pleased to see the work of the farm and the bull calves produced there. Results of crossing local sheep with Merino ram have also been encouraging. There is decided improvement in quality of wool. The difficulty in sheep breeding on Tegur Farm is that many die of a disease which is being investigated by the Veterinary Assistant. Hay and silage were prepared as usual and jowar was grown for fodder.

(20) *Experiments in cultivators' fields.*—The District staff continued to conduct useful experiments in cultivators' fields. Dharwar No. 1 × Dharwar No. 2 called Jayawant was compared with Dharwar No. 1 in six cultivators' fields on a large scale in each of the two villages, Amergol and Kusugal near Hubli, where there is considerable attack of wilt. In all the 12 cases Jayawant was almost free from wilt whereas Dharwar No. 1 suffered much. The yields of Jayawant were decidedly better than those of Dharwar No. 1 cotton. The trial of Jayawant cotton against local at Haveri was also in favour of Jayawant. Dharwar No. 1 × Rosea. Jayawant and local cottons were compared at Bailhongal and they yielded 484 lbs., 452 lbs. and 356 lbs. seed cotton, per acre, respectively. Dharwar No. 1 × Rosea cross gives good yield and ginning percentage but suffers from wilt. Four selected strains of Mugad variety, viz., No. 161 Early, Nos. 81 and 249 Inter and No. 141 Late, and three strains of Antersal variety, viz., No. 67 Early, 90 Inter and 200 Late were compared with local in different places round Belgaum, Dharwar, Haveri, Hangal and Mundgod. All these selected strains have done better than local, in most places, and deserve distribution on a large scale. Two strains of Mugad Inter, viz., 81 and 249 were compared side by side with local in four places. In two places No. 249 is observed to be better than 81, while in the other two places 81 better than 249. Results of past three years taken together are in favour of No. 249. Nadiad No. 6 tobacco gave better yield than Nipani at Sadalga, Haveri and Bableshwar. Seed rate experiment with groundnut conducted at Haveri and Bagalkot, is in favour of 80 lbs. against 40 to 60 lbs. Results of artificial manures on jowar and cotton at Dharwar, Haveri and Bailhongal are not at all encouraging. Sulphate of ammonia has given some significant results on jowar only at Bailhongal but not in other places. Dry farming experiments conducted at Bijapur and Bagewadi are in favour of shallow ploughing. Observations on these various experiments in cultivators' fields were made at regular intervals and harvesting was done under close supervision of the District staff. All observations and yields have been carefully recorded in experimental note books.

(b) *Propaganda*

(21) *District cotton work.*—Multiplication and distribution of Dharwar No. 1, Gadag No. 1 and Dharwar No. 1 × Rosea cross cotton seeds, continued round Hubli, Gadag and Bailhongal, respectively. As Dharwar No. 1 is found to be susceptible to wilt, it was decided that Dharwar No. 1 × Dharwar No. 2 called Jayawant should take its place and

consequently a part of the reserved area, viz., 1,000 acres to which pedigree seed was available, came under Jayawant. Next year the whole of the reserved area will go under this cotton and Dharwar No. 1 will altogether be rejected. Seed of various varieties belonging to different generations was sown in the reserved areas and the crop was inspected from time to time and rogued. The produce was collected and ginned separately and seed obtained was stocked for distribution during the coming season. The quantity of work done is summarised in the following statement.

Name of the variety	Generation	Quantity of seed distributed in lb.	Area sown in acres	Quantity of produce obtained in dekhas	Quantity stocked for distribution in lb.
Jayawant	IV	8,994	1,003	622	167,106
Dharwar No. 1	III	3,780	412	279	69,090
Do.	IV	34,972	4,160	1,663	329,489
Gadag No. 1	III	541	72	114	20,874
Do.	IV	6,077	622	299	69,165
Do.	V	226,483	14,607	5,325	1,216,500
Dharwar No. 1 × Rosea	III	800	110	66	13,300
Do.	IV	....	..	369	75,600
Do.	V	....	..	203	41,300
Dharwar No. 1	V	9,380	617	295	74,200
					2,076,624

The quantity of pedigree seed raised from reserved areas during the year, is more than that of the last year especially in the case of Gadag No. 1 cotton.

(22) The distribution of seed up to the 5th generation and roguing in the reserved area was under the direct control of the Cotton staff as usual. For distribution of general seed in the 6th generation the Cotton Sale Societies and the Officers of the Agricultural Department continued to work together. Gadag Dalals' Association and seed dealers in Ron and Gadag also stocked and distributed certain quantities of Gadag No. 1 cotton seed which they had preserved from the general crop. Dharwar No. 1 × Rosea cross cotton seed was distributed by the Bailhongal Cotton Sale Society round Bailhongal. The estimated area in acres sown with pure seed of improved varieties during the year through different agencies, is given below :—

Name of variety	Area controlled by the cotton staff directly	Area sown with reserved seed stocked by the societies	Area sown with seed stocked by other agencies	Total
Jayawant	1,003	....	....	1,003
Dharwar No. 1	5,197	54,600	....	59,797
Gadag No. 1	15,300	57,000	52,000	124,300
Dharwar No. 1 × Rosea	1,991	1,909	....	3,800

There is gradual reduction in the area under Dharwar No. 1, cotton, as it is intended to be replaced by Jayawant. The area under Gadag No. 1 is steadily maintained. Progress of Dharwar No. 1 $\times$ Rosea cross round Bailhongal seems to be doubtful as it is very susceptible to wilt like Dharwar No. 1. Trial for one year more will decide its fate.

(23) *New seed multiplication schemes.*—Pure pedigree seeds of Dharwar No. 1 and Gadag No. 1 cottons are now distributed to an area of about 75,000 acres in each case. The Hubli and Gadag Cotton Sale Societies are not able to organise larger reserved areas and purchase larger quantities of seed. In order to enable them to do the needful, schemes were submitted to the Indian Central Cotton Committee for financial help. Both these schemes aim at the distribution of absolutely pure seed at cheap rates to the cultivators of 2 lacs of acres in each case. The Indian Central Cotton Committee has kindly sanctioned these schemes and has offered munificent subsidies to achieve the object in view. The staff proposed has been appointed and the new schemes have actually been brought under operation. Three more similar schemes for Haveri, Bailhongal and Athani centres are under further consideration. It is contemplated with these 5 new schemes to cover the whole Dharwar-Kumpta area with improved varieties of cotton evolved by the Agricultural Department.

(24) *Grading and auction sales.*—In all 524 dokras of Jayawant, 3,935 dokras of Dharwar No. 1, 14,251 dokras of Gadag No. 1 and 1,524 dokras of Dharwar No. 1 $\times$ Rosea cotton were graded and sold by auction in different centres against 4,489 dokras of Dharwar No. 1, 11,149 dokras of Gadag No. 1, and 2,081 dokras of Dharwar No. 1 $\times$ Rosea last year. It will be seen from this statement that progress of Dharwar No. 1 and Dharwar No. 1 $\times$ Rosea is declining whereas that of Gadag No. 1 is steady. The Gadag Cotton Sale Society held 5 auction sales, Hubli 2 and Bailhongal and Haveri one each. The prices of cotton during the year under report were considerably low and the area under cotton is likely to fall during the coming season.

(25) *Working of the Cotton Transport Act.*—1,031 licenses by road and 178 by rail were issued from Gadag office to import 29,544 and 3,851 dokras, respectively. The number of licenses issued from Bagalkot office was 237 for 6,263 dokras by road and 81 for 2,694 dokras by rail. The import by rail without licenses is altogether stopped but that by road is still going on to a certain extent. 18 check stations were established during the year to stop illicit import by road. The working of these check stations was found to be rather imperfect, as they had to be managed by discharged Sanadis with a low pay of Rs. 5 per month. Improvement in the administration of these check stations is under careful consideration. To form an idea of the quantity of illicit import of cotton into the protected areas, the account books of the Cotton Dalals in Bagalkot and Gadag were inspected. No cotton came without license into Bagalkot market. This is largely due to two convictions effected by the Magistrate at Bagalkot and confirmed by the Bombay High

Court last year on the complaints lodged by the Department referred to in paragraph 24 of the last year's report. The inspection of accounts at Gadag revealed that a large number of dokras have been imported without license from outside the Protected area. The fact has been brought to the notice of Gadag Dalals and merchants and they have been warned not to take delivery of such cotton. The Cotton Transport Act on the whole continued to work well in the interests of the grower and consumer of Kumpta and Dharwar-American cottons.

(26) *General District Work.*—The District Agricultural Overseers as usual held numerous demonstrations of improved agricultural implements such as iron ploughs, wheat thresher, circular chaff-cutter, iron leveller, disc harrow, Chatanooga sugarcane crusher, clod crusher, stone roller and groundnut hand-huller. One hundred and seven of these have been reported to be very successful. The demonstrations of seed-sieves in Gadag Division attracted the attention of the cultivators with a result that 25 of these were sold on the spot. Construction of Poona furnace was undertaken in four places of the Mundgod Division and three of Chikodi Division. Demonstrations of field-embankments were conducted in a few places and important points in them were brought to the notice of the cultivators. The pest of the grass hoppers was mild, when compared to that of last year. Demonstration of tarred tin sheet operation was a common propaganda for the District Staff all over the Division. A number of cultivators prepared and used their own tin-sheets. Organisation on co-operative basis was undertaken by the District Staff in four places. Many other villages followed suit. The Belgaum Rice Hopper Committee destroyed this year 40,000 lbs. of rice-hoppers at a cost of Rs. 3,000. The method of fumigating potatoes against potato-moth with petrol fumes was demonstrated to potato-growers of Belgaum. Some big cultivators constructed their own fumigating pits. The potato crop at Belgaum used to suffer much from the attack of Jassides. Dusting with sulphur and spraying with lime-sulphur wash were found to be effective remedies. An intensive propaganda was conducted and a number of gardens were treated during the year. A dozen cultivators have purchased their own dusting and spraying machines. A very intensive propaganda was conducted by the District Staff while on tour among cultivators to carry their produce to the nearest Sale Societies for sale. Seven water-lifts in Bailhongal Division and two in Mundgod have been introduced. Seven hundred and seventy-nine mango grafts and 504 other fruit trees were distributed. Improvement in the quality of wool is being effected in the Chikodi Division by the introduction of Merino rams and attempts are also in progress here and there for poultry breeding.

(27) Agricultural and Cattle Shows were held at Hosritti, Devargudda, Kittur and Kudapli in the Dharwar District, at Bijapur in Bijapur District and at Athani, Kokatnur, Nanadi and Yedur of Belgaum District. Most of these are places where cattle fairs are annually held and it was very gratifying to observe that the local Committees took great interest

in organising the Shows as required by the Agricultural Department and distributed prizes to the best of the cattle. During these shows and at the time of other demonstrations, lectures were delivered on agricultural improvements and public attention was drawn to the question of direct utility to the respective tracts. An Agricultural and Co-operative Conference was held at Kudapli of Dharwar District under the Presidentship of the Deputy Director of Agriculture, S. D., Dharwar. An Agricultural Library was opened there at the same time. Another Agricultural Conference was organised on Arbhavi Farm by all Taluka Development Associations of Belgaum District working together. It was presided over by the Director of Agriculture, B. P., Poona, and many important agricultural problems of the District were discussed. The opening ceremony of the "Village Development Saunstha at Kakhandki" of the Bijapur District was performed by the Deputy Director. Many great men of the District were present at the occasion.

(28) *Propaganda against smut on jowar.*—This work was continued mainly through Revenue Officers. The District staff conducted a number of demonstrations in co-operation with the Mamlatdars at important centres. In all 25,500 packets were distributed (7,000 in Belgaum District, 14,000 in Dharwar District and 4,500 in Bijapur District). This was sufficient to treat seed for about 102,000 acres. In Bijapur District the use of copper sulphate packets was replaced by that of sulphur dust. The Collector of Bijapur purchased 10 tons and distributed 8,220 lbs. of sulphur dust during the year. In the other two districts only 60 lbs. of sulphur dust were experimented in different places. There are still a number of copper sulphate packets on hand here and there with the Mamlatdars and it is decided that they should be used first.

(29) Many interesting articles were contributed to the local Kanarese Agricultural Magazine from time to time. The articles such as "Groundnut stacking", "Fruit Culture", "Motor Tractor", and "Manures and their use" were found to be very useful to the cultivators. Departmental leaflets were distributed in all demonstrations and meetings. Correspondence with individual cultivators also increased considerably.

(c) Organisation

(30) The Seed Society at Devi-Hosur alone did some good work. Others showed no appreciable progress.

(31) The Co-operative Cotton Sale Societies at Hubli and Gadag continued to do good work. To increase the scope of their work, new seed-multiplication schemes on an extensive scale were launched with subsidies from the Indian Central Cotton Committee, Bombay. The Bailhongal Co-operative Cotton Sale Society also continued to do good work but was boycotted at the end of the season. Other Sale Societies

are making very little progress. The progress of different Sale Societies is tabulated below :—

Name of Society	Number of members	Share capital	Number of dokras sold			Value of cotton
			By auction	By private treaty	Total	
		Rs.				Rs.
Hubli	2,602	17,399	5,445	11,097	16,542	6,20,500
Gadag	1,980	41,120	11,855	8,612	20,467	8,44,098
Ballhongal	307	4,180	2,245	3,559	5,804	2,01,396
Haveri	76	7,240	1,081	202	1,283	45,628
Bijapur	192	2,865	..	1,297	1,297	68,548

(32) The Nipani Tobacco Sale Society sold 4,962 maunds of jarada at a price of Rs. 50,380 and realised a net profit of Rs. 245. The Sanskeshwar Sale Society sold different articles worth Rs. 32,713 but sustained a loss of Rs. 101. The Byadgi Chilly Sale Society achieved considerable progress this year. 444,000 lbs. of chillies worth Rs. 50,054 were sold with a net profit of Rs. 1,050 against 423,780 lbs. of Rs. 39,640 last year.

The Cattle Breeding Societies at Kadampur, Karur, Sadalga and Anapur showed better progress than last year.

(33) *Fencing Societies*.—Benefits of fencing against wild pigs are recognised by cultivators all over Mallad Tract but joint action is getting difficult owing to the apathy of the absentee landlords. The legislation under contemplation to coerce minority should soon be effected for further progress. The Fencing Scheme at Arbhavi was completed and papers for registration are being sent. This scheme will protect 8,000 acres of the irrigated land in the Gokak Canal Tract and cost Rs. 14,000. The length of the fence will be seven miles and it will be only along the hills. The fencing scheme at Tegur was not successful and had to be abandoned. In Mundgod Division individual cultivators purchased ten miles fencing during the year. During the past two years 31 cultivators of six villages fenced an area of about 1,049 acres with 17 miles of wire fencing. There is a demand for five miles more. Efforts are in progress to start joint fencing schemes. Stonewall fencing at Hulihonda and Hungund has proved beneficial. A joint scheme at Bamnigatti in Kalghatgi Taluka of Dharwar District has become ripe and action will be taken during the coming season.

(34) Campaigns for the removal of prickly pear, a shelter to wild pigs, continued as before in the Mundargi Petha of Dharwar District. In all up till now prickly pear standing on 130 acres of Government waste land and nearly 160 acres of private land, has been removed. No additional tagai loan was taken during the year. Out of the total amount of Rs. 14,400, an amount of Rs. 12,356 has already been paid back up till now. The total cultivated area estimated to be protected in six groups of

villages where operations are in progress, is 46,000 acres. The incidence of the cost of this campaign is about eight annas only per acre but the benefits to be derived are immense. An experiment to see whether prickly pear can be removed by poisoning more economically, is in progress.

(35) The campaign against wild deer referred to in paragraph 35 of last year report, continued in three more villages. A subscription of Rs. 740 was collected and spent for the purpose. The total protected area is about 12,000 acres. The number of deer killed was 136 and many more were injured. Local people are now being trained for this work. As the pest of deer is largely increasing, the cultivators are anxious to organise such campaigns and it is hoped that work in this direction will extend.

(36) Twelve Taluka Development Associations continued to work during the year. Formation of Mundargi Petha Association referred to in paragraph 37 of last year report was sanctioned by Government and it will start its work during the coming season. All the prickly pear committees now existing in Mundargi Petha, will merge themselves into the Association. An amount of Rs. 4,000 has now been collected for the proposed Halyal Taluka Development Association. The important works done by various Taluka Development Associations are as follow :—

The Gadag and Ron Taluka Development Associations organised crop protection works against deer. This public service has gained more popularity for them. Fodder storage and collection of produce for Sale Society at Gadag are other main activities. The Gadag Association is working all round in the interest of the cultivators and maintains its position in "A" class. The Hangal Taluka Development Association took interest in the spread of improved strains of paddy and the use of artificial manures such as "Sulphate of Ammonia". The Haveri Association did special work in popularising the use of tarred tin-sheets against jowar-hoppers and organised some campaigns on a large scale. The Associations at Indi and Bijapur attempted to make their farms model ones. The grape vine cultivation has been a very paying concern at Indi and has attracted the attention of many garden cultivators in the neighbourhood. The Bijapur Association has started a small nursery. The Athani Association continued to show interest in cattle-improvement and held two cattle shows, one at Athani and the other at Kokatnur. The Chikodi Association distributed 20 tons of sulphate of ammonia for sugarcane. The Gokak Association held an Agricultural Conference at Arbhavi in co-operation with the Taluka Development Associations of Athani and Chikodi. In general, all these Associations conducted demonstrations of improved agricultural implements, helped Cotton Sale Societies in distribution of seed of improved strains of cotton and conducted extensive propaganda against jowar smut. Some of these Associations distributed in all 1,484 copper sulphate packets and 1,250 tolas of sulphur dust. The total amount of subsidy given to these bodies amounted to Rs. 5,673.

(37) The Dharwar District Agricultural Association is sinking in its financial condition. Implements and their spare parts worth Rs. 417-8-0 were sold at a net gain of Rs. 20. The hire-proceeds of iron ploughs were only Rs. 28-12-0, against Rs. 62 last year. The sale of 631 margo grafts brought a net profit of Rs. 46-6-0. The tractor owned by the Association ploughed only 77 acres against 90 acres last year and sustained a loss of Rs. 722-2-0 on account of frequent breakdowns. Income from other sources being very limited, the Association finds it difficult even to maintain its staff. Attempts to revive it have not been successful. The whole position of the Association is to be thoroughly discussed in its next general meeting.

The Wilson Ante-Famine Institute at Bijapur lost its founder, Mr. V. H. Naik, whose death is much felt in the District. Almost all the activities of the Institute were continued. An expert hand to guide the Institute has become a need and the matter is under consideration.

(38) The Divisional Board of Agriculture held its quarterly sessions regularly and guided the work of the Taluka Development Associations and the District Staff of the Agricultural and Co-operative Departments. Important recommendations of the Board were "Classification of Taluka Development Associations according to merit" and "Inclusion of Kumpta and Upland cottons into the Broach Hedge Contract".

(d) Direct Services to the Public

(39) *Field Embankments.*—One Bunding Officer continued to work in the Bijapur District and the other in Dharwar and Belgaum Districts. All the District Agricultural Overseers of the Bijapur District also inspected and guided bunding work. Bunding is greatly progressing in the whole of the Division. There is a great demand for expert advice, but the staff is limited. In the Bijapur District plans and estimates were prepared for 32 schemes costing Rs. 41,800 in 30 villages. Traced copies of 25 schemes were supplied to cultivators. Besides these, 14 schemes for reclamation of small nala beds were prepared which were estimated to cost Rs. 17,100. 26 schemes of last year and 10 of the current year were inspected and necessary advice for repairs was given, where needed. A training class in bunding was held to train special tagai staff of the Revenue Department. In Belgaum and Dharwar Districts, 45 schemes extending over 700 acres in seven villages were prepared and their estimated cost was Rs. 11,400. In addition to these, a block of 313 acres was surveyed and levels were taken at Tallur to have a second joint scheme. Many of the individual schemes are under execution. To study the methods of bunding in Karl soil, an experiment was laid out with a small Government subsidy at Nargund where the soil is mostly Karl. A wooden waste weir was experimented at Kurtkoti. All the necessary material was collected for writing a bulletin on the subject of bunding. Eight wooden models of different schemes under different conditions were prepared for exhibiting in Demonstrations and Shows.

(40) *Boring*.—There are five Musto Power Machines in the Division. In all 31 bores were taken and the total depth bored was 2,531 feet against 2,285 feet last year. Out of these 16 succeeded, 10 failed and the rest 5 are in progress. The details of each bore are given in Appendix A.

(41) *Work of the Mechanical Assistant*.—He overhauled the machines on the different Farms of the Division and attended to repairs when needed. Five engines, seven centrifugal pumps, and four grinding mills for agricultural purposes were erected in Bijapur District and one Power Cane Crusher in Dharwar District. Plans and estimates for nine Pumping Plants were supplied in Bijapur District and for one in Belgaum District. Repairs to engines in both these Districts were attended and a sum of Rs. 57-8-0 was realised. The number of Power Pumping Plants is increasing, especially in Chikodi Taluka of the Belgaum District and Bijapur and Indi Talukas of the Bijapur District. The time of the Mechanical Assistant was very fully engaged.

(42) *Karajgi Fodder Storage*.—All stacks of fodder were rethatched. As a result of intensive propaganda, 1,792 bales of 1925 weighing 141,495 lbs. were sold for Rs. 986-2-9 to cultivators in the eastern parts of Haveri and Ranabennur talukas.

(43) *Tagai Loan Applications*.—Besides those for bunding in Bijapur District referred to in paragraph 39 amounting to Rs. 41,800, tagai loan applications amounting to Rs. 23,300 for various land improvement schemes received through Co-operative Societies and Revenue Officers, were dealt with in Dharwar and Belgaum Districts, against those amounting to Rs. 61,265 last year.

(c) *Agricultural Education*

(44) The Vernacular Agricultural School at Devi-Hosur completed its sixteenth year and during this period 194 students passed out. 13 students in the first year, 10 students in the second year and 5 vernacular teachers for Agricultural bias classes received education during the year. Results of the annual examination continued to be good. It is a matter of pleasure to note that 115 past students of this school are working on their own Farms. The District Staff guided them in their work. The popularity of the school can be judged by the number of applications received for admission which rose to 168 during the year. The school continued to be managed by only one graduate assistant, Mr. V. C. Pavate. The Agricultural bias classes grew more popular and there is a demand for their increase. Examinations of all the Agricultural bias classes were conducted by the District Staff of the Agricultural Department. As this work, however, has greatly increased, it is high time that the District Local Boards should have their own examining staff.

(45) *Publications*.—Material was supplied for modification of leaflet No. 2 of 1910 on "Groundnut cultivation of Spanish peanut", of proposed leaflet on "Destruction of Rice Grass hoppers", of leaflet No. 6 of 1913 on "Methods of Field Irrigation" and notes on "Rabi and Kharif potato cultivation in Karnatak". A leaflet was drafted on

"Reclamation of alkali lands in the Gokak canal tract". Besides these, leaflet No. 8 of 1915 on "Proper Planting of cane sets", leaflet No. 3 of 1929 on "Sugarcane crushing", leaflet No. 8 of 1929 on "Land Leveller", leaflet No. 10 of 1929 on "The use of crude night soil as a manure", leaflet No. 13 of 1929 on "Control of the grain smut of jowar", leaflet No. 16 of 1929 on "Earthing up of sugarcane by the Sabul plough", and leaflet No. 17 of 1929 on "Sugarcane" were translated into Kanarese.

(46) Other important works done during the year were as follow :—

(i) The proposed Hippargi, Nandargi, Nandgaon, Indi and Ingalgi Irrigation schemes prepared by the Superintending Engineer, Minor Irrigation Works, were inspected by the Deputy Director and reports were submitted thereon.

(ii) A number of crop cutting experiments were conducted in bunded v. non-bunded fields with a view to estimate the benefits of bunding.

(iii) The system of growing maize with tur in the Gokak Canal tract received particular attention and is getting popular.

(iv) The Deputy Director attended the Indian Central Cotton Committee's meeting at Indore to explain his cotton seed multiplication schemes for the Southern Division in the Bombay Presidency.

(v) The Eleventh Divisional Officers' Conference of the Agricultural Department in the Southern Division was held as usual.

(vi) The Deputy Director attended the Research Committee Meeting at Poona and took part in its deliberations.

(f) General

(47) The work of the Agricultural Department in the Southern Division continued to extend, especially in the direction of bunding, fencing and spread of improved strains of cotton, groundnut and paddy crops. I cannot but reiterate that the Staff needs strengthening with more funds for their travelling allowance. The growing work cannot be curtailed and the existing staff had to work hard to cope with it. All the members of the staff did their duties well. The organisation of campaigns against deer conducted by Mr. V. S. Kulkarni, is a new activity in the Division and deserves special mention for the year. Many Revenue Officers and private gentlemen continued to help our propaganda and organisation work and my thanks are due to all of them.

(48) His Excellency, the Right Hon'ble Sir Frederick Hugh Sykes, P.C., G.C.I.E., G.B.E., K.C.B., C.M.G., the Governor of Bombay, paid his visits to Gokak and Dharwar Farms. Her Excellency Lady Sykes accompanied His Excellency to Gokak Farm. Their Excellencies were received by the Deputy Director of Agriculture and were taken round the Farms. They spent a good deal of their valuable time in inspecting the various interesting experiments conducted there, and expressed their appreciation. A very interesting Agricultural Stall was arranged at the time of their Excellencies' visit to Red Cross Fete at Dharwar and it received much approbation from Their Excellencies and the public.

Lastly the Deputy Director had an interview with His Excellency wherein he explained the important activities of the Agricultural Department in the Southern Division, viz. Bunding, Fencing and the Spread of Improved Strains of different Crops and the benefits derived by the people therefrom.

S. S. SALIMATH,

Deputy Director of Agriculture,
Southern Division, Dharwar.

Statement showing particulars of bores made in

Serial No.	Name of well owner.	Survey No.	Name of Taluka.	Name of Village.	Surface or well with dimensions of the well.	Diameter of bore
1	2	3	4	5	6	7
<i>District Dhurwar.</i>						
1	Sirdar B. Y. Ghorpade ..		Gadag ..	Gajendragad ..	Surface ..	4"
2	Mr. Mallargowda Patil ..		Do. ..	Kurtkoti ..	Well 28' x 42' ..	4"
3	Do. No. 2 ..		Do. ..	Do. ..	Surface ..	4"
4	Mr. D. R. Patil ..		Do. ..	Do. ..	Well 6' x 45' ..	4"
5	Mr. Fakirappa Laxmeshwar. ..		Do. ..	Do. ..	Well 30' x 30' x 40' ..	4"
6	Mr. Govindgowda ..		Do. ..	Do. ..	Surface ..	5"
7	Mr. K. G. Kulkarni ..		Bankapur ..	Taralhatti ..	Surface ..	4"
8	Municipality Hubli ..		Hubli ..	Hubli ..	Do. ..	6"
9	Mr. N. G. Bhadri ..		Halyal ..	Halyal ..	Well 12' x 30' ..	4"
10	Municipality Halyal No. 4 ..		Do. ..	Do. ..	Surface ..	4"
11	Sub-division Office P. W. D. ..		Do. ..	Do. ..	Do. ..	4"
12	Mr. M. M. Tergavkar ..		Do. ..	Do. ..	Do. ..	4"
13	Mr. M. M. Bhadri ..		Do. ..	Do. ..	Do. ..	4"
14	Mr. Shripadrao Deshpande ..		Do. ..	Do. ..	Well 6' x 8' x 35' ..	4"
<i>District Belgaum.</i>						
15	Club Gokak ..		Gokak ..	Gokak ..	Surface ..	4"
16	Mr. Tatyappa Mirjee ..		Hukeri ..	Sankeshwar ..	Do. ..	4"
17	Mr. D. N. Kulkarni ..		Do. ..	Do. ..	Do. ..	4"
18	Mr. Durdundi Patil ..		Do. ..	Do. ..	Well 16' x 40' ..	4"
19	Mr. Vasudeorao Bhide ..		Do. ..	Do. ..	Well 12' x 35' ..	4"
20	Mr. S. G. Kolekar ..		Do. ..	Do. ..	Surface ..	4"
21	Mr. Revansiddappa ..		Do. ..	Do. ..	Do. ..	4"
22	Mr. Chaturchand Gujar ..		Chikodi ..	Nipani ..	Do. ..	4"
23	Mr. Jambappa Avte ..		Do. ..	Do. ..	Do. ..	4"
24	Do. do. ..		Do. ..	Do. ..	Do. ..	4"
25	Mr. Kothivale ..		Do. ..	Do. ..	Do. ..	4"
26	Mr. Islampure ..		Do. ..	Do. ..	Do. ..	4"
27	Mr. Solapurkar No. 2 ..		Do. ..	Do. ..	Do. ..	4"
28	Do. No. 3 ..		Do. ..	Do. ..	Do. ..	4"
29	Mr. Kargave ..		Do. ..	Do. ..	Do. ..	4"
30	Mr. Atmaramshet Gujar ..		Do. ..	Do. ..	Do. ..	4"
31	Mr. Dhondichand Balaram ..		Do. ..	Do. ..	Do. ..	4"

Southern Division during the year 1929-30

Depth of actual bore.	Water before bore in gallons per hour.	Water after bore in gallons per hour.	No. of gallons increased per hour by boring.	Labour charges.	Cost of fuel, lubricating oil, coal, casing, cutting shoe, etc.	Departmental charges for the wellowner.	Supervision and depreciation charges.
8	9	10	11	12	13	14	15
				Rs. a.	Rs. a. p.	Rs. a. p.	Rs. a. p.
60'	Nu	300	300	38 12	114 12 0	65 0 0	49 12 0
111'-8"	150	1,050	900	54 12	50 10 0	148 4 0	131 7 9
123'	Nu	300	300	24 12	181 0 0	168 8 8	152 13 0
70'	Nu	300	300	22 14	106 10 0	80 0 0	82 14 8
43'	200	1,000	800	23 5	45 9 0	43 0 0	50 15 0
70'-6"	In progress			....	....	....	84 7 7
208'	Nu	50	50	260 12	540 14 0	Nu	301 4 3
134'	Nu	In progress		....	....	....	251 1 9
54'	40	900	260	85 0	154 1 0	56 0 0	10 0 8
130'	Nu	250	250	268 2	163 7 6	170 0 0	137 3 6
80'	Nu	400	400	....	....	95 0 0	33 2 7
146'	Nu	250	250	224 13	216 8 0	194 0 0	151 12 4
100'	Nu	300	300	85 15	117 1 0	125 0 0	104 0 0
63'	Nu	In progress		....	....	....	65 7 4
91'	Nu	Nu	Nu	123 0	116 4 0	Nu	80 4 0
104'	Nu	Nu	Nu	62 8	53 4 0	Nu	102 0 0
200'	Nu	125	125	109 8	92 10 0	Nu	194 0 0
50'	Nu	Nu	Nu	30 8	17 11 0	Nu	49 0 0
50'	Nu	Nu	Nu	23 0	25 12 6	Nu	49 0 0
60'	Nu	100	100	....	....	Nu	67 2 0
		In progress					
65'-8"	Nu	300	300	22 0	54 7 6	73 8 0	28 14 0
55'	Nu	300	300	17 8	50 2 0	57 8 0	45 6 0
90'	Nu	100	100	37 8	142 7 0	Nu	74 6 6
97'	Nu	300	300	40 0	76 13 6	120 8 0	80 0 0
62'	Nu	350	350	40 0	80 8 0	68 0 0	51 2 6
115'	Nu	100	100	85 0	111 2 6	Nu	95 0 0
76'-6"	Nu	50	50	60 0	66 14 9	Nu	63 8 6
54'	Nu	300	300	17 8	65 0 6	56 0 0	44 8 6
60'	Nu	250	250	26 4	52 13 6	65 0 0	49 8 0
25'	Nu	In progress		....	....	....	20 0 0

Statement showing particulars of bores made in

Serial No.	Name of wellowner.	Survey No.	Name of Taluka.	Name of Village.	Surface or well with dimensions of the well.	Running expenses mechanic's wages and repairs.
1	2	3	4	5	6	16
<i>District Dharwar</i>						
						Rs. a. p.
1	Sirdar B. Y. Ghorpade ..		Gadag ..	Gajendragad ..	Surface ..	179 8 6
2	Mr. Mallargowda Patil ..		Do. ..	Kurkotli ..	Well 28' x 42' ..	476 0 0
3	Do. do. No. 2 ..		Do. ..	Do. ..	Surface ..	550 9 3
4	Mr. D. R. Patil ..		Do. ..	Do. ..	Well 6' x 45' ..	297 14 0
5	Mr. Fakrappa Laxmeshwar. ..		Do. ..	Do. ..	Well 30' x 30' x 40' ..	183 11 9
6	Mr. Govindgowda ..		Do. ..	Do. ..	Surface ..	300 0 0
7	Mr. K. G. Kulkarni ..		Bankapur ..	Taralhatti ..	Do. ..	1,205 0 0
8	Municipality Hubli ..		Hubli ..	Hubli ..	Do. ..	1,002 3 6
9	Mr. N. G. Bhadri ..		Halyal ..	Halyal ..	Well 12' x 30' ..	40 7 0
10	Municipality Halyal No. 4 ..		Do. ..	Do. ..	Surface ..	500 3 6
11	Sub-division Office P. W. D. ..		Do. ..	Do. ..	Do. ..	307 12 9
12	Mr. M. M. Tergavkar ..		Do. ..	Do. ..	Do. ..	561 13 4
13	Mr. M. M. Bhadri ..		Do. ..	Do. ..	Do. ..	384 9 6
14	Mr. Shripadrao Deshpande ..		Do. ..	Do. ..	Well 6 x 6" x 35' ..	242 5 0
<i>District Belgaum.</i>						
15	Club Gokak ..		Gokak ..	Gokak ..	Surface ..	313 14 0
16	Mr. Tatyappa Mirjee ..		Hukeri ..	Sankeshwar ..	Do. ..	364 7 0
17	Mr. D. N. Kulkarni ..		Do. ..	Do. ..	Do. ..	701 0 0
18	Mr. Durdundi Patil ..		Do. ..	Do. ..	Well 16' x 40' ..	175 3 0
19	Mr. Vasudeorao Bhide ..		Do. ..	Do. ..	Well 12' x 35' ..	175 3 0
20	Mr. S. G. Kolekar ..		Do. ..	Do. ..	Surface ..	241 12 0
21	Mr. Bevansiddappa ..		Do. ..	Do. ..	Do. ..	....
22	Mr. Chaturchand Gujar ..		Chikodi ..	Nipani ..	Do. ..	112 4 0
23	Mr. Jambappa Ayte ..		Do. ..	Do. ..	Do. ..	178 0 9
24	Do. do. ..		Do. ..	Do. ..	Do. ..	291 5 0
25	Mr. Kothivale ..		Do. ..	Do. ..	Do. ..	314 0 0
26	Mr. Islampure ..		Do. ..	Do. ..	Do. ..	200 8 6
27	Mr. Solapurkar No. 2 ..		Do. ..	Do. ..	Do. ..	372 5 0
28	Do. No. 3 ..		Do. ..	Do. ..	Do. ..	247 9 0
29	Mr. Kargave ..		Do. ..	Do. ..	Do. ..	174 13 0
30	Mr. Atmaramshet Gujar ..		Do. ..	Do. ..	Do. ..	194 3 9
31	Mr. Dhondichand Balaram ..		Do. ..	Do. ..	Do. ..	80 15 0

Southern Division during the year 1929-30—contd.

Cost of bore to the well-owner.	Cost per foot for the wellowner.	Total cost of bore inclusive of wellowner's and Departmental cost.	Total cost per foot.	Object of boring, i.e., Agricultural or drinking.	Remarks; i.e., Successful, unsuccessful, or incomplete, on hand or abandoned.
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
218 3 0	3 9 0	442 12 6	7 6 0	Agricultural ..	Successful.
258 10 0	2 4 6	861 1 9	7 11 1	Do. ..	Do.
374 4 8	2 14 5	1,077 10 11	3 5 8	Drinking ..	Do.
209 3 0	3 0 0	590 4 8	3 6 11	Do.	Do.
111 14 0	2 9 7	346 3 9	3 0 11	Agricultural	Do.
....	....	....	....	Do. ..	In progress.
801 10 6	3 13 8	2,307 14 3	11 1 6	Do. ..	Fail.
....	....	....	....	Drinking ..	In progress.
295 1 0	5 7 5	346 4 3	6 6 7	Do.	Successful.
601 9 6	4 7 6	1,239 0 6	9 8 6	Do. ..	Do.
Information not supplied by owner.				Do. ..	Do.
635 5 0	4 5 7	1,343 14 1	9 3 9	Do. ..	Do.
328 0 0	3 4 5	816 9 6	3 2 7	Do. ..	Do.
....	....	....	....	Drinking ..	In progress.
239 4 0	2 10 0	647 6 0	7 1 9	Drinking ..	Fail.
115 12 0	1 1 9	582 3 0	5 9 6	Domestic ..	Do.
202 2 0	1 0 2	1,097 2 0	5 7 9	Drinking ..	Fail partial.
57 3 0	1 2 3	281 6 0	5 10 0	Do. ..	Fail.
47 12 6	0 15 3	271 15 6	5 7 0	Do. ..	Do.
....	....	....	....	Do. ..	Do.
....	....	....	....		In progress.
140 15 6	2 5 0	291 1 6	4 6 6	Do. ..	Successful.
125 2 0	2 4 4	348 8 9	6 5 4	Drinking ..	Do.
179 15 0	2 0 0	545 10 6	6 1 0	Do. ..	Fail.
237 5 6	2 7 1	631 5 6	6 8 0	Do. ..	Successful.
188 3 0	3 0 7	440 3 0	7 1 7	Agricultural	Do.
190 2 6	1 12 1	663 7 6	5 12 3	Drinking ..	Fail.
126 14 9	1 10 6	438 0 3	5 11 0	Do. ..	Do.
133 8 6	2 9 0	357 14 0	6 10 0	Do. ..	Successful.
79 1 6	1 5 1	322 13 3	5 6 1	Do. ..	Do.
....	....	....	....		In progress.

APPENDIX F

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, GUJARAT, SURAT, FOR THE YEAR 1929-30

I—Staff

The work during the year was controlled and guided by Mr. B. S. Patel, who went on four months' leave at the end of the year from 12th May 1930 when the present incumbent took charge.

Messrs. C. S. Patel, K. B. Naik and D. P. Mankad held respectively the posts of the Cotton Superintendent, Surat tract, Divisional Superintendent of Agriculture, N. D., Ahmedabad, and Cotton Breeder, North Gujarat, Viramgam, during the year. Mr. M. L. Patel, the Cotton Breeder, South Gujarat, Surat, was on leave from April to June when Mr. V. M. Majmudar, the Tobacco Breeder, Nadiad, acted for him.

II—Season

2. The rainfall during the year was very irregular. The monsoon commenced in the third week of June and soon after sowings were commenced all over Gujarat. During the middle of July there were heavy rains which spoiled the germinating crops in many places causing re-sowings. After the middle of July to end of September there were intermittent light showers which were not sufficient for the rice crop and it practically failed all over Gujarat. The Bajri and Jowar crops came out fairly well. There were good rains in the beginning of October in Surat and Broach Districts and this allowed the Cotton and Jowar crops of this tract to come out normally. Due to scanty rains the Cotton season commenced early by about a month and the area under Rabi crops was considerably reduced.

3. There appeared locust swarms in October and November in North Gujarat and it caused some damage to the standing crops. Due to locust fright the cultivators in many places harvested immature crops which deteriorated in value.

4. There was an unprecedented aphid plague on the Variali crop of the Kaira District and the whole crop of nearly 8,000 acres was totally destroyed. Government sanctioned Rs. 2,000 for taking protective measures against this plague and all the available staff was put in the District for demonstration and propaganda work. Spraying with Fish Oil Rosin soap was extensively demonstrated. As the attack had increased beyond limit the crop could not be protected but it had a good educative value.

III—Research and experimental work

5. The work done by different sections is summarised under the following heads as in previous reports :—

- (1) Research on crop breeding ;
- (2) Research on crop pests ;
- (3) Experimental Station work ;
- (4) Experimental trials in cultivators' fields.

(1) RESEARCH ON CROPS BY BREEDING WORK IN SURAT DISTRICT

6. *Cotton*.—Surat 5¹ was compared with 1027 A.L.F. in 10 replications during the year and the yield of Kapas of Surat 5¹ was lower than that of 1027 A.L.F. by 9·8 per cent. On large scale trial by the Superintendent it yielded 3 per cent. less than 1027 A.L.F. The actual yields and ginning percentages during the past four seasons compare as under :—

Characters	1926-27		1927-28		1928-29		1929-30		Average	
	1027 A.L.F.	Surat 5 ¹	1027 A.L.F.	Surat 5 ¹	1027 A.L.F.	Surat 5 ¹	1027 A.L.F.	Surat 5 ¹	1027 A.L.F.	Surat 5 ¹
1. Kapas in lbs. per acre ..	510	547	700	713	568	553	597	543	594	589
2. Lint in lbs. per acre ..	180	205	242	258	200	205	200	193	205	215
3. Ginning percentage ..	35·3	37·5	34·6	36·1	35·3	37·2	33·3	35·3	34·6	36·5

During the year the yield of Surat 5¹ was particularly low but on an average it appears to do equally well and its ginning percentage is higher by 1·5 to 2 per cent. in all seasons. It is proposed to give it a thorough trial next season by growing it on a large scale. The crop was shown to some cultivators of the surrounding villages and it was thought by them that the slight defect in opening will not come in the way of its cultivation. Its spinning value is nearly the same as that of 1027 A.L.F. and has been from 28^s to 32^s warp during the past four years as tested at the Matunga Laboratory.

7. Selection 1A long boll type was compared with 1027 A.L.F. in 10 replications and it gave 3·2 per cent. higher yield than that of 1027 A.L.F. and its ginning percentage was higher by 3·3 per cent. than that of 1027 A.L.F. This cotton is grown by most of the Co-operative Cotton Sale Societies in the tract and it is intended to replace it by Surat 5¹ in the long run.

8. A White flowered herbacium type which was found some years back from a local field was compared with 1027 A.L.F. in 10 replications and it gave 28·3 per cent. more yield than 1027 A.L.F. This type appears to be a very good yielder ; but its ginning percentage is lower by about 1 per cent. than that of 1027 A.L.F. and its bolls are small. This type will be further studied and data obtained for future guidance.

9. The crosses made between 1027 A.L.F. and Nandyal 14, Aligarh 19 and Ghoghari A-26 last year were grown in F¹ generation and new crosses between 1027 A.L.F. and White flower type, Comilla and Jayawant were made during the year. These will be studied with a view to build up a type having higher ginning and spinning value than 1027 A.L.F.

10. The Cotton Breeder continued to produce selfed seed of 1027 A.L.F. ; and the selfed seed and purified seed of 1027 A.L.F. was supplied to the Surat Farm for sowing. He also continued to grow some pure strains of different types for observation.

11. *Jowar*.—The most promising type Budh Perio 53 was again tested in 10 replications in comparison with Local Perio. It yielded 14.7 per cent. more than the local during the year and the results of the last three years are confirmed. It has been distributed in the District on a large scale and propaganda will be made to spread it all over the District. Some pure strains of other types are also maintained for general observations. A Leaflet on the type was prepared and distributed in the District.

Work in Broach District

12. *Cotton*.—The presence of wilt on the Broach Farm has retarded the progress of work there. With a view to establish wilt resistant types with high ginning, new crosses have been made between a local wilt resistant strain and Comilla and Jayawant. It is observed that all types with high ginning introduced from outside come down in ginning at Broach and this adds to the difficulty in establishing wilt resistant types with higher ginning. Last year's selections from local with high ginning and wilt resistance failed.

13. Broach Deshi No. 8 continues to show very high wilt resistance and among Ghoghari types Ghoghari A-26 shows wilt resistance till very late in the season so that even with the wilt a very large number of bolls come to maturity and give a fair yield of crop.

14. *Jowar*.—The four strains Nos. 8, 10, 12 and 178 mentioned in paragraph 9 of last year's report were compared with the local in random replication tests and it was found that strains Nos. 12 and 8 were the best in yield confirming previous experience No. 12 is slightly taller in growth but had slightly inferior grain due to lodging in the season; while No. 8 has the characteristic difficult emergence of the head. No. 10 is slightly early in flowering and ripening and has got large white grain. Nos. 8 and 12 will be tested in the District. No. 178 is rejected as it is inferior in yield to the remaining three types.

15. In order to decide the distance over which natural cross fertilization occurs in Rabi Jowars of the Broach District, No. 8 was grown in a square yard in the centre of a crop of No. 10 in one acre and the open seed of No. 10 has been collected for studying how far there has been natural crossing from various distances and from each of the four directions.

Work in Kaira District

16. *Tobacco work at Nadiad*.—Strain No. 6 which is popular in Gandiu growing tract was compared with the local Gandiu type by "Half drill strip" method in 7 replications and the increase in yield was 7.8 per cent. and the difference was significant. This has confirmed the previous year's results. This strain is now well established in the tract and arrangements have been made to produce pure seed on the Farm and distribute it to the seed growers in the District.

17. Strain No. 28 which is useful for the Piliu growing tract was compared with local Piliu and No. 38 by the Fisher's method in 8 replications. The results were in favour of No. 28 by an increase of 13.5

per cent. over the local. No. 38 did not show any superiority over No. 28 and will be discontinued from the next year. Arrangements have been made to produce pure seed of No. 28 and distribute it in the District.

18. *Crosses*.—12 segregates from the cross between No. 6 and Bhengi made in 1926-27 was in F3 generation and 5 segregates from the cross No. 6 and Adcock made in 1926-27 which was also in F3 generation were studied during the year. Selections have been made for further study in the fourth generation in both the crosses.

19. Several other selections from the local varieties have been made and were maintained pure for further sowings. Study of their economic characters was continued. During the year some fresh seed samples have been collected from the District for further exploration with a view to get if possible better strains than those already obtained.

20. It is generally believed that the smoking quality of Tobacco bears some relation to the number of leaves kept at the time of nipping. To determine the exact number of leaves which give highest yield compatible with good smoking quality, an experiment has been carried out since last three years on strain No. 6 where plants were nipped after keeping 14, 16 and 18 leaves. The results obtained so far show that the plants nipped after keeping 18 leaves give the best outturn with good smoking quality. This experiment will be continued for further observation.

21. *Bajri at Nadiad*.—203 ear-heads from the samples collected last year from different parts of Gujarat were sown during the year under report by ear to row method. After studying their morphological characters, they were classified into eleven types representing all the samples collected. About 340 plants representing all these types were bagged and selfed seed collected. These will be tested further in the coming season.

22. *Castor at Nadiad*.—Six strains of Castors were received from the Economic Botanist to Government of Bombay, Poona, for testing their suitability in Gujarat. As the rains were scanty during the year the crop had to be irrigated, so the results were not comparable. Part of the Castor work has been transferred from the Economic Botanist to Government of Bombay, Poona, to Gujarat and a plot has been rented in the village of Vina near Nadiad where Castors are grown on a large scale. Testing of the different types will be carried on there in the coming season.

Ahmedabad District

23. *Cotton at Viramgam*.—Wagad 8 was compared with the local according to "Half drill Strip" system in 10 replications and its yield was more than that of the local by 8.6 per cent. in Kapas and by 19.7 per cent. in lint. The ginning percentage of Wagad 8 was 33.8 while that of the local was 30.7 and its staple length was 1.89 cms. as against 1.80 cms. of the local. These results confirm the previous years' experience. The seed of this Cotton has been given to cultivators for testing in the coming season.

24. Seven selections from Cutch-Kathiawar collections were replicated with wagad 8 and the local in four series and of these strains Nos. B.B.M, K 4-1 and C 3-3-1 were found superior to the rest. The selection No. C 3-3-1 from Cutch was the most promising as during last year. These will be studied further for their economic characters.

25. A fresh collection of 32 selections was made from the District with a view to obtain better strains and these were tried during the season. From among these, 10 strains have been selected for further study next year.

26. The following 3 hybrids were under study :—

Serial No.	Hybrid	Generation
1	Wagad 8 × Tashkent	F ¹
2	Wagad 8 × F ¹ (Wagad 8 × 1027 A.L.F.) ..	F ²
3	Wagad 8 × 1027 A.L.F.	F ³

Seven cultures from No. 2 and 19 from No. 3 have been selected for further study and selection.

(2) RESEARCH ON CROP PESTS

27. *Work on Jowar Stem-borer at Surat.*—This work was closed at the end of the year after a study of 9 years. It was financed from the Sir Sassoon David Trust Fund at a total cost of Rs. 27,000. A detailed study of the life and habits of the borer has been made and after a number of experiments it is determined that the best method to deal with the insect is to prevent its emergence in monsoon from the Kadbi fodder and Jowar stubbles of the previous year. This can best be achieved by the chaffing of Kadbi before storage and sunning and burning of uprooted Jowar stubbles. The different kinds of grasses which were kept under observation were not found to help to carry over the pest in off season in a very material way. The whole work will be published in the form of a Memoir next year.

28. *Katra Control Work at Nadiad.*—The work was carried out on the Old Nadiad Farm as in the previous year. The attack during the year was greater than that of the last year and the observations made from the experience of the season were as under :—

(1) Moths emerge within 36 hours of the rain fall which is sufficient to wet 5 or 6 inches of soil.

(2) Maximum emergence takes place within 5 days of heavy rainfall that wets 10 inches of soil.

(3) A good many caterpillars invade the field crops from adjacent head-lands and hedges.

(4) A Kitson lamp to 5 acres was fairly effective in the catch of moths.

(5) It appears that Patromax lamps are more convenient and cheaper than Kitson-lamps.

29. This work will be continued in the next season with a view to determine the most effective position where lights should be kept in relation to hedges and head-lands, so that the maximum area can be controlled. As most of the pupæ are found near hedges and in head-lands and as the young caterpillars generally hatch from these places, poison spraying will be tried on head-lands and hedges with a view whether the young caterpillars can be killed before they reach the crop in the field and incidence of damage done in controlled and uncontrolled areas will be determined.

30. *Wilt Survey*.—With a view to ascertain the incidence of wilt affection, a survey was undertaken in Broach, Kaira, Ahmedabad and Panch Mahals Districts. This work was financed from the Funds of the Indian Central Cotton Committee and two Graduate Assistants were placed on special duty for it. Eight villages in each Taluka were selected and in each village ten fields of cotton distributed in different directions were examined and the extent of damage was worked out in relation to the area of the field.

The observations and data obtained show the following conclusions :—

(1) *Fusarium* wilt is found only in black soils of the Broach District.

(2) *Rhizoctonia* is found only in Goradu and Besar soils of Kaira, Ahmedabad and Panch Mahals. It is rare in the black soils of Broach.

(3) The *Fusarium* wilt affection was very low during the year due to scanty rains and in the Broach District the incidence was practically nil.

(4) *Rhizoctonia* attack generally ranged from 1 to 5 per cent. in the Goradu soils of North Gujarat.

(5) It appears that *fusarium* wilt is more virulent in years of good rainfall than in years of scanty rainfall.

(6) Low-lying parts of a village are more susceptible to *fusarium* wilt than high-lying areas.

(3) EXPERIMENTAL STATION WORK

(a) *Surat Agricultural Station*

31. *Season*.—The total rainfall was above normal amounting to 55 inches; but the peculiarity of it was that nearly 35 inches of it fell during the first fortnight of July and during the remaining period of the monsoon it rained only in light intermittent showers. The sowings were made in the third week of June, but these were washed off in some places during the heavy rains in July and gaps had to be filled in by re-dibbling. Though the rainfall was not well distributed the crops came out normally beyond expectation.

32. *Cotton*.—The area under Cotton was 47 acres and 28 gunthas all of which was sown with 1027 A.L.F. The average yield of Kapas was 540 lbs. per acre. The resulting seed was distributed in selected villages of Athwa, Bardoli and Vijalpore Groups for further multiplication and distribution, 1027 A.L.F. and Surat 5¹ were compared in two adjacent

half acre plots and their respective yields were 424 and 412 lbs. per acre.

33. *Jowar*.—The area under Jowar was 70 acres and all of it was sown with Budh Perio No. 53 for distribution in the District. The average yield per acre was 883 lbs. Budh Perio No. 53 fared well when compared with Althan Deshi No. 6 in spite of deficient late rains.

34. *Ridge Sowing*.—The ridge sowing method is practised on the whole Farm area since four or five years and the experience gained shows that it is the only method for a successful stand of plants ensuring average yield either in case of heavy rains or in draught. But the chief drawback is that it is outside the means of an average cultivator to prepare ridges high enough to ensure successful stand. The practice followed on the Farm is to prepare ridges 14" high. But with a view whether smaller ridges can be prepared with indigenous implements at the disposal of an ordinary cultivator with less labour and whether such ridges will be as successful, trials were taken during the year under report but due to unfavourable circumstances the results were not significant and it is decided to make further attempts in this direction.

35. *Manurial Experiments*.—A new series of experiments was laid out during the year in which Sulphate of Ammonia at the rate of 15 lbs. and 20 lbs. of Nitrogen per acre and mixture of Sulphate of Ammonia and Castor cake with the same quantity of Nitrogen per acre in proportion of $\frac{3}{4}$ of Nitrogen in the form of the former and $\frac{1}{4}$ in that of the latter was applied as top-dressing in the beginning of September. But as there were no rains afterwards the effect of manures was not visible and the results obtained were not significant. The plots were laid out in five replications as per Dr. Fisher's Random method on flats as well as on ridges. These will be carried out again next season.

36. *Soil Fertility*.—A plot was manured with 20 cartloads of Farm Yard Manure in 1915-16 and since then it is cropped with Cotton and Jowar in alternate years without any manure with a view to see whether the fertility of black Cotton soils is maintained without any manure. So far 8 Cotton crops and 7 Jowar crops have been taken on the plot till the year under report and the average results came to 435 lbs. of Cotton and 807 lbs. of Jowar per acre as against the average of 437 lbs. of Cotton and 754 lbs. of Jowar of the farm during these respective years. This shows that the fertility of black Cotton soils is maintained even without manure if proper cultivation and rotation is followed.

37. *Breeding herd on Surat Farm*.—The strength of the herd on 1st April 1930 was 116 as against 114 on 1st April last year. 20 Animals were auctioned off in January 1930 and three bulls were issued in the District for breeding purposes. Two new bulls Alo and Ravishankar from two good milk yielding families were used freshly for service and it is hoped that by line breeding the milk yield will be increased without sacrificing the size of the animal. The old bulls Agakhan and Padshah are now available for issuing in the District. General health of the cattle was very well maintained, there being only three casualties as against 11 last year.

38. The total milk yield during the year was 80,990 lbs. as against 84,306 lbs. of last year. The annual average per head during the year was 2,353 lbs. as against 2,757 lbs. last year. The percentage of dry animals to total was 30.9.

) *Amalsad Farm*

39. *Sugarcane*.—Eleven varieties were grown during the year; of these, Red Sports, Manjav, Striped Mauritius and J. 247 are promising. They are thick semi-soft canes suitable for places where sweet water is available in plenty and are popular amongst cultivators. Co. 213 a variety obtained from Coimbatore is a thin hard cane with good tillering and it is useful for places where the waters are brackish and not plentiful. A cultivator has taken 5 ratoon crops from this variety and the yield of the fourth ratoon was 2,775 lbs. of Gul per acre. This variety is getting popular in places where the water is not plentiful as it is able to pull on even with less waterings.

40. *Manurial Experiments on Sugarcane*.—Nitrogen in the form of Sulphate of Ammonia and Castor cake applied at the rate of 100 lbs. per acre—50 lbs. in the form of Ammonia and 50 lbs. in that of Cake, gave 15 per cent. more yield than the control plot. The plots treated with Sulphate of Ammonia and Castor cake alone at the rate of 50 lbs. of Nitrogen per acre did not show any response to the manures. All the plots received Farm Yard Manure at the rate of 20 cart-loads per acre and were green manured with Sann.

41. *Red-rot*.—This disease appeared during the year after an absence of eight years and it affected some of the thick-semi soft varieties such as Manjav and Striped Mauritius. The thin hard varieties such as Co. 213, Co. 210 and Co. 290 were free from this disease. The incidence of the disease was from 20 to 30 per cent. and its cause appears to be the scanty rains in August and September.

42. *Ginger, Turmeric and Suran*.—These were again tried during the year on broad ridge method versus local bed system; the results were in favour of the local bed system and it appears the broad ridge system is not suitable to the local conditions of Amalsad. There was severe attack of borer in these crops during the year and the crops on the ridge were more badly affected than those in the beds. Castor cake given at the rate of 2,400 lbs. per acre to the Ginger crop gave 6,120 lbs. of Rhizomes per acre against 5,852 lbs. in the plot treated with Sulphate of Ammonia, Sulphate of Potash and Superphosphate at the rate of 45 lbs. of Nitrogen, 52 lbs. of Potash and 22 lbs. of phosphorus. The results of Turmeric treated with Castor Cake at the rate of 1,200 lbs. per acre against Sulphate of Ammonia, Sulphate of Potash and Superphosphate at the rate of 62 lbs. of Nitrogen, 176 lbs. of Potash and 54 lbs. of Phosphorus were in favour of the artificial mixture to the extent of 1,200 lbs. per acre. The effect of artificials on the Suran crop was better than that of the Castor cake by nearly 4,000 lbs. per acre.

43. *Miscellaneous*.—The plantation of Parwar which has been established on the Farm is doing good and during the year 312 pairs

of cuttings were supplied in the District. Two varieties of Pine-apples introduced from Ceylon did well and there is a good demand for their suckers. The Farm distributed about 4 tons artificial manures in the form of Sulphate of Ammonia, Super-phosphate and Sulphate of Potash to the neighbouring cultivators.

(c) *Dohad Farm*

44. *Maize*.—The local method of sowing with plough was compared with drill sowing, in 5 replications according to Dr. Fisher's Random method. The results were in favour of drill method sown 18" and 2' apart to the extent of 14 and 32 per cent., and this confirms the experience of previous years. The average yield of Maize crop on the Farm was 1,261 lbs. per acre as against 751 lbs. of last year.

45. *Groundnuts*.—The groundnut crop yielded on an average at the rate of 860 lbs. per acre as against 558 lbs. of last year. In the rotation experiment of Maize-Wheat *vs.* Groundnut-Gram, the gram crop could not be taken in the rabi season after groundnut, as there was not sufficient moisture in the soil.

46. *Paddy*.—Jirasal rice was grown in all rice beds and it yielded on an average at the rate of 2,200 lbs. per acre. In a series of manurial experiments on rice, Sann green manuring gave better results than the Farm Yard Manure alone and Farm Yard Manure combined with Sulphate of Ammonia or Castor cake.

47. *Cotton*.—Banila Cotton was sown during the year under report and it gave an average yield of 776 lbs. per acre. As compared with Maize-Gram rotation it paid economically better by about Rs. 10 per acre.

48. *Wheat*.—Six Wheat varieties were grown during the year, of which Pusa 4 and Wagia continued to give better results. The average yield of Wheat was 997 lbs. per acre. as against 934 lbs. during the last year. In a series of experiments in spacing on Wheat the local method of sowing one foot apart gave better results than sowing 15" and 18" apart.

49. *Gram*.—In all about 15 acres were under Gram crop and it gave an average yield of 508 lbs. per acre. Only yellow gram is sown, other varieties being discontinued.

50. *Seed distribution*.—The Farm serves as a centre for distribution of pure seeds through Co-operative Societies of the tract and during the year the following seeds were distributed :—

1. Maize	..	..	..	7,251 lbs.
2. Spanish Peanut	..	..	..	1,472 "
3. Pusa 4 Wheat	..	..	..	5,240 "
4. Gram	..	..	..	817 "
5. Jirasal Rice	..	..	..	210 "

51. *Miscellaneous*.—The fruit orchard which was destroyed by frost in the preceding year did not give any return and steps are being taken

to renovate it. Sundhia Fodder which has been introduced since last two years did not do well due to want of late rains and yielded only 2,470 lbs. of fodder as against 8,120 lbs. of last year. Berseem gave 13,106 lbs. of green fodder per acre. Garden crops such as tomatoes and chillies were tried on a small scale and they did fairly well.

(4) EXPERIMENTAL TRIALS IN CULTIVATORS' FIELDS

52. *Cotton*.—Wagad 8 was compared with Local Wagad at five places in Dholka and Virangam Talukas. Due to short rain-fall the yields were not good in some places ; but on an average of all the 5 places the yield of Wagad was 342 lbs. per acre as against 355 lbs. of the Local.

53. *Jowar*.—Jowar strain No. 12 bred on the Broach Farm was tried at five places in the District and it gave higher yield at three places varying from 14 to 30 per cent. while at two places it was less by one per cent. Budh Perio No. 53 tried at Vijalpore in Jalalpore Taluka yielded 690 lbs. per acre as against 647 of Local.

54. *Wheat*.—Strain No. 162 received from the Crop Botanist to Government of Bombay, Poona, was tried at three places in the Broach District and it gave 17 to 25 per cent. more yield than the Local ; but the grain of this Wheat is short and dull in colour as compared with that of the Local. Pusa 4 was compared with Wagia at three places in the Jhalod Mahal and it gave 15 to 18 per cent. more yield. Pusa 4 was also compared with Chandushi at 6 places in the Kaira District and the results were in favour of Pusa 4. Strain No. 224 continued to give better results in Dholka and Dhandhuka Talukas and arrangements are made for further spread.

55. *Bajri*.—Bhavnagri Bajri was compared with Local Bajri at three places in the Broach District and four places in the Kaira District. It gave better results, but the people do not appreciate it as it is late and loose in the ear-head.

56. *Rice*.—Kolamba No. 79 was tried at three places in Jalalpore and Pardi Talukas. On an average it yielded 1,933 lbs. per acre as against 1,821 lbs. of the Local Kada.

57. *Tobacco*.—Strain No. 6 when compared with Piliu gave 38 to 56 per cent. more yield under irrigated conditions. Under dry conditions also it gave better results ranging from 18 to 30 per cent. This strain has given better yields in all parts of Gujarat wherever it has been tried and in the Kaira District it is now grown on more than a thousand acres. Strain No. 28 which is intended to replace Piliu gave 50 per cent. more yield in Sunav village of Borsad Taluka and arrangements were made to distribute it on a larger scale in the coming season.

58. *Manurial Experiments*.—The District staff arranged a large number of manurial experiments with Sulphate of Ammonia, Nitrate of Soda, Sulphate of Potash, etc., on the various crops grown in the Division and they were demonstrated to the cultivators.

IV—Organisation

59. *Divisional Board.*—Four meetings of the Divisional Board were held during the year, at which questions of general importance were discussed and Resolutions passed for the consideration of the Joint Board. The Board as usual controlled and guided the work of the propaganda staff and Taluka Development Associations.

60. *Taluka Development Associations.*—There were 6 Associations during the year, viz., Chorashi, Pardi, Jalalpore, Anand, Borsad and South Daskroi. All of them did useful work in the general propaganda of agricultural improvements in their Talukas. The Pardi Association did very good work in distributing seed of Kolamba No. 79 which has been found better than the local Kada rice and the Anand and Borsad Associations did very useful work in introducing the new Tobacco strains in the District.

61. *Agricultural Co-operation.*—The District Agricultural Overseers are trying to work their propaganda through the Co-operative Credit Societies wherever possible. In the Panch Mahals District propaganda for the distribution of pure Spanish Peanut seed was undertaken through the Societies and nearly 19,000 lbs. of pure seed was stored and distributed through the Co-operative Banks. Similarly pure seed of Maize, Wheat and Gram from the Dohad Farm to the extent of 15,000 lbs. in all was distributed through the Societies.

62. *Cotton Transport Act.*—This remained in force in the amended form and as no barrier was put on the river Tapti, the seed of Selection 1A has spread in the area south of the river. Now there are nearly two dozens of Co-operative Cotton Sale Societies in the British and Baroda territories of this tract and most of them have taken to growing Selection 1A seed, so the putting of a barrier will not now materially assist in checking its spread. The only thing which can improve the matter is to find out a strain which can give the same ginning outturn as Selection 1A and keep up the spinning quality of 1027 A.L.F. We have a type of cotton in Surat 5¹ combining both these qualities, but its opening is slightly defective. It has been proposed to give it a thorough trial next season and if the cultivators approve of it, it will be taken up for distribution.

V—Propaganda

63. *Cottons—Surat tract.*—During the year the area of 1027 A.L.F. Cotton grown under the supervision of the Department was 12,717 acres. The total quantity of *kapas* obtained from this area was 4,360 Bhars (bhar = 924 lbs.) which was ginned at four centres under the supervision of the Cotton staff. This yielded 1,610 Candies of lint (Candy = 800 lbs.) which was sold in the open market at a premium varying from Rs. 10 to Rs. 15 per Candy. The total quantity of seed purchased from the Director's Personal Ledger Account, was 25,51,500 lbs. of which 15,16,200 lbs. was supplied to the Rajpipla and Chhota Udepur States and the remaining quantity of 10,35,300 lbs. was distributed in the tract, through 20 seed-depôts opened at suitable centres. The

Indian Central Cotton Committee gave a subsidy of Rs. 7,000 to meet the expenses of running the depôts so that the seed can be distributed at cost price to the cultivators. The subsidy is much appreciated and will be very useful in making the seed popular by selling it at cost price. The prices of cotton ranged very low from Rs. 325 to 360 per Candy as against Rs. 400 to 475 during the last year.

64. *Cotton—Ahmedabad District.*—Wagad 4 which was distributed in Dholka Taluka last year was discontinued from distribution during the year as there were complaints regarding its low ginning outturn and it is now decided to distribute only Wagad 8. The area under Wagad 8 was 150 acres which was all through natural spread. Arrangements have been made to distribute the seed from the Viramgam Breeding Station to registered seed growers for the propagation of the strain.

65. *Tobacco No. 6.*—This strain has now established in many parts of the Kaira District and 600 lbs. of its seed was distributed in the District. Nearly 1,000 acres are now grown under this strain.

66. *Groundnuts.*—Two types of Groundnuts early and late are grown in Gujarat and their area is increasing every year. The early types comprising Spanish Peanuts and Japanese small are mostly grown mixed in the Eastern Mahals of the Panch Mahals District and during the year efforts were made to grow and distribute pure Spanish Peanut in this area. As a result of this 19,000 lbs. of pure seed was stored and distributed through the Co-operative Societies.

67. *Pusa 4 Wheat.*—This Wheat has been now well established in the Dohad and Jhalod Talukas of the Panch Mahals District and nearly 3,000 acres are under it. It is being tried in other parts of the Division and has given good results in many places.

68. *Rice.*—Kolamba No. 79 has been introduced in the Southern part of the Surat District and nearly 200 acres were under it. Kolamba No. 42 is doing well in South Daskroi Taluka and 100 acres were grown under this strain in the village of Jetalpur.

69. *Miscellaneous crops.*—The District staff carried out numerous trials in introducing new crops in localities where such crops were not grown; and as a result of this Sugarcane variety Co. 213, Potatoes and Variali, have been introduced in some villages of the Godhra and Kalol Talukas of the Panch Mahals District. Sann green manuring is getting popular in the Broach District and the District Agricultural Overseer, Broach, distributed 10,800 lbs. of this seed during the year.

70. *Distribution of seed.*—Important seeds distributed by the District staff were 8,560 lbs. of Cotton seed in Broach District, 27,160 lbs. of Cotton seed in North Gujarat, 800 lbs. of Paddy, 6,464 lbs. of Wheat, 7,420 lbs. of Groundnuts, 13,400 lbs. of Maize; 654 lbs. of Tobacco seed, 10,000 lbs. of Potatoes, 205,600 sets of Sugarcane, 3,720 Fruit trees and cuttings.

71. *Distribution of Manures.*—The Imperial Chemical Co. and the Chilean Nitrate Syndicate have opened Agencies in Gujarat and the

District staff remains in close touch with them. The quantity of manures distributed were 100 tons of Sulphate of Ammonia, 8 tons of Nitrate of Soda and 7 tons of other manures consisting Bone-meal, Superphosphate and Sulphate of Potash. Permits for 3,200 maunds of denatured salt were issued.

72. *Distribution of Implements.*—Improved implements worth Rs. 6,400 were distributed through the Departmental Agency. These consisted chiefly of 11 Bulsar Rahats, one Chatanooga Mill and 20 Malwa ploughs and harrows. Three pumping plants were constructed under the advice of the District staff, two in Ahmedabad District and one in Broach District.

73. *Shows and Demonstrations.*—There was no Show held during the year; but 94 Demonstrations were arranged on Demonstration plots where the crops under demonstration and working of implements were shown to the people. The total number of demonstration plots arranged by the District staff were 266.

74. *Distribution of Copper-sulphate packets.*—The total number of packets distributed was 2,575. The District Agricultural Overseer, Broach, observed that there were four kinds of smuts in the Jowar crop, viz. (1) whole head smut, (2) grain smut, (3) loose smut and (4) long smut, of which only the grain smut and loose smut are amenable to the treatment; but whole head smut and long smut are rare.

75. *Distribution of poison for Pigs and Jackals.*—The Entomological Assistant, Gujarat, distributed 71 packets of arsenic and 527 packets of Strychnine hydrochloride for poisoning pigs and Jackals.

76. *Cattle Breeding.*—There were 15 breeding bulls in the Non-breeding zones of Gujarat and these were inspected by the District staff. The distribution of the bulls according to Districts was as under :—

District				Number of bulls
Ahmedabad	..	..	..	4
Kaira	..	..	..	2
Panch Mahals	..	..	..	..
Broach	..	..	..	..
Surat	..	..	..	9
Total ..				15

VI—Agricultural Services

77. *Boring.*—During the year there were seven Machines in work, four Musto Power Machines, one Cawnpur Power Machine, one Armstrong Machine and one Calyx Drill Power Machine. The total depth bored was 3,391 feet and the total number of bores made during the year was 47 including two incomplete bores of last year. Of these 28 were successful and 18 unsuccessful, while one bore was incomplete at the end of the year. The statement of detailed information regarding boring work is appended herewith.

78. *Mechanical help.*—The Mechanical Assistant, Gujarat, was deputed under the Agricultural Engineer to Government of Bombay, Poona, as Boring Overseer and he joined his duties in this Division from 4th September 1929; so his services were available only for ten months and during this period he erected four pumping plants, inspected 24 plants for advice, attended repairs of five plants, prepared estimates and site surveys for 15 plants. He also gave lectures to the students of the Vernacular Agricultural School at Surat on the working of Oil Engines and their management.

VII—Agricultural Education

79. *The Vernacular Agricultural Schools at Godhra and Surat.*—These completed their 10th and 7th year respectively. There were 16 students at Godhra—nine in the first year and seven in the second. The number of boys at Surat was 25—thirteen in the first year and twelve in the second. Of the 16 students at Godhra 15 were successful at the Annual Examination—nine in the first year and six in the second. The number of successful students at Surat was 21—eleven in the first year and ten in the second.

80. The boarding charges per boy per month come to Rs. 10-12-0 at Godhra while that at Surat was Rs. 8-0-0.

81. The question of re-organising these schools is under consideration and it is proposed to give Scholarships to the students instead of boarding them at Government cost. But it is problematical how far students will be attracted to these schools if the amount of scholarship is not sufficient to meet the boarding expenses of the boys. The best use of these institutions can be made as training centres for teachers for agricultural bias schools; but no serious attempts are made to push such schools.

VIII—Publicity

82. The Broach Quarterly Magazine continued its publication under the auspices of the Broach District Agricultural Association and the staff contributed articles of agricultural interest for it.

IX—Miscellaneous

83. His Excellency the Governor of Bombay visited the Tobacco Breeding Station at Nadiad on 3rd January 1930 and made enquiries regarding the work conducted there.

84. It is gratifying to note that there has been very good awakening amongst the cultivators all over Gujarat in introducing improved and profitable crops and the District staff has to meet many enquiries regarding supply of new seeds, fruit plants, manures, etc., and remain fully engaged in meeting these requirements. The installation of pumping plants is increasing every year wherever there is good supply of water and people seek advice from the Agricultural Department regarding suitable engines and pumps. Several enterprising cultivators have gone in for Mechanical tractors especially in the Surat District; but they have not yet proved economically successful.

85. *Personal.*—There were many changes in the subordinate staff due to inefficiency and unsuitability in particular posts and it is being readjusted so as to ensure the maximum efficiency. On the whole the staff put in good work with few exceptions.

C. S. PATEL,

Ag. Deputy Director of Agriculture,

Surat, the 25th July 1930.

Gujarat, Surat.

STATEMENT

Serial No. of Bores	Names of well or land-owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of well	Diameter of bores
1	2	3	4	5	6	7
	BORES LEFT INCOMPLETE LAST YEAR AND COMPLETED THIS YEAR <i>Ahmedabad District</i>					
11 of 1929	Taluka Local Board, Sanand.	..	Sanand	Rampura	42'	3"
	<i>Surat District</i>					
16 of 1929	Sardar Faramroz B. Garda.	..	Jalalpore	Jalalpore	Surface	4"
1929-1930	NEW BORES UNDERTAKEN IN 1929-30 <i>Surat District</i>					
1	Sardar Gardaji. Faramroz B.	..	Jalalpore	Jalalpore	Surface	4"
2	Jehangir B. Gardaji	223	Do.	Do.	Do.	4"
3	Nagarji Naranji	4	Pardi	Pardi	40'	6"
4	Sorabji B. Gardaji	..	Jalalpore	Jalalpore	Surface 19' pit	4"
5	Dorabji Pestonji	55	Do.	Do.	Do. 20' pit	4"
6	Rustomji Bamanji	1	Pardi	Dungri	34'	6"
7	Bhagubhai Dwarakadas	126	Olpad	Sayan	Surface 14' pit	6"
8	Chhotubhai Raychand	..	Pardi	Paria	28'	6"
9	Manekshaw F. Manekshana.	..	Bulsar	Kalmada	33'	4"
10	Chhotubhai Raychand	..	Pardi	Paria	28'	6"
11	Lilachand Virchand	1242	Do.	Do.	25'	6"
12	Dorabji Pestonji Baria	8	Jalalpore	Jalalpore	Surface 18' pit	4"
13	Lilachand Virchand	1242	Pardi	Paria	25'	6"
14	Koli Gandia Kalia	12	Do.	Do.	30'	6"
15	Patel Dahyabhai Premabhai.	648	Bulsar	Kalmada	27'	4"
16	Manibhai Haribhai	481	Bulsar	Atgam	53'	4"
17	Jehangirji H. Madan	83	Chorasi	Tuki	Surface 15' pit	5"
18	Pirojshaw Bhikhai Vandriwala.	290	Jalalpore	Vijalpore	34'	4"
		2				

Depth of actual bores	Water before boring in gallons per hour	Water after boring in gallons per hour	Number of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating coal, casing, pipes, cutting, shoes, etc.	Departmental charges for well-owners	Average Departmental Expenditure on the Bore including :-
							Supervision and Depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
(137') 37'	500	1,500	1,000	112 8 0	200 0 0	180 8 0	231 12 11
(108')	<i>Nil</i>	<i>Nil</i>	<i>Nil</i>	40 0 0	40 0 0	.....	185 10 0
129'	...	500	500	43 4 0	221 15 0	168 8 0	224 11 10
110'	..	500	500	30 12 0	184 4 0	140 0 0	189 1 0
64'	500	1,500	1,000	18 0 0	39 8 0	71 0 0	110 0 0
92'	...	500	500	24 13 0	150 2 0	113 0 0	168 2 0
80'	..	500	500	20 7 0	131 8 0	95 0 0	137 8 0
30'	1,000	2,000	1,000	4 0 0	55 12 0	30 0 0	51 9 0
80'	..	500	500	50 0 0	195 13 6	95 0 0	137 8 0
31'	1,000	2,000	1,000	6 0 0	34 0 0	31 0 0	53 5 6
48'	500	2,500	2,000	18 8 0	83 0 0	52 0 0	82 8 0
30'	1,000	2,000	1,000	4 0 0	15 8 0	30 0 0	51 9 0
15'	500	500	..	5 0 0	25 0 0	.....	25 12 6
30'	..	500	500	44 10 0	138 0 0	108 8 0	152 15 6
15'	500	500	..	5 0 0	30 0 0	.....	25 12 6
77'	500	500	...	15 0 0	45 0 0	.....	132 5 6
39'	1,000	2,000	1,000	26 4 0	90 4 0	39 0 0	67 0 6
30'	500	2,500	2,000	24 12 0	82 2 0	30 0 0	51 9 0
99'	<i>Nil</i>	2,000	2,000	67 8 0	230 8 0	123 8 0	168 11 10
90'	1,000	1,500	500	35 4 0	180 12 0	110 0 0	154 11 0

Serial No. of Bore.	Names of well or land-owner.	Survey No.	Name of Taluka.	Name of Village.	Surface bore of well bore with dimensions of well.	Diameter of bores.
1	2	3	4	5	6	7
NEW BORES UNDERTAKEN IN 1929-30—contd.						
<i>Surat District—contd.</i>						
19	Chhotubhai Raychand ..	..	Pardi	Paria	30'	6"
20	Ukabhai Gopalji ..	..	Bulsar	Jujma	43'	4 1/2"
21	Chhotubhai Raychand ..	..	Pardi	Paria	30'	6"
22	Koli Soma Prema ..	169	Jalalpore	Karadi	20'	4"
23	Ranchhodhbhai Naranji ..	77 5+7	Pardi	Dungari	35'	6"
24	Sheth Patagji Virchand ..	414	Bulsar	Jujma	38'	5"
25	Govindbhai Vallabhbbhai ..	272	Do.	Thakarwada	40'	4 1/2"
26	Nichhabhai Fakirbhai ..	..	Do.	Do.	43'	4 1/2"
27	Bhanabhai Govindbhai ..	366	Do.	Jujma	45'	4 1/2"
28	Ranchhodhbhai Rattanji ..	..	Do.	Padaria	37'	5"
29	Dajibhai Naranbhai ..	..	Do.	Jujma	52'	4 1/2"
30	Rustomji Bamanji Avasia ..	..	Pardi	Dungari	35'	6"
31	Haria Harkha ..	..	Do.	Do.	30'	6"
<i>Ahmedabad District.</i>						
1	Taluka Local Board Sanand (Dharamshala).	..	Sanand	Chharodi	Surface	3"
2	Vallabhai Shivabhai ..	353	North Daskroi	Gota	57'	4"
3	Do. do. ..	353	Do.	Do.	57'	4"
4	Taluka Local Board, Sanand.	..	Sanand	Kalana	18'	3"
5	Galabbhai Sherkhan ..	..	Do.	Do.	39'	3"
6	Udyoga Mandir ..	..	North Daskroi	Sabarmati	50'	4" reduced to 2 1/2" from 10 3/4"
7	Suraji Kalaji..	..	Sanand	Soyala	33'	3"
8	Gujarat Vidyapith ..	218 to 220	North Daskroi.	Navrangpur	40'	4"

Depth of actual bores.	Water before boring in gallons per hour.	Water after boring in gallons per hour.	Number of gallons increased per hour by boring.	Labour charges.	Cost of fuel, lubricating, coal, carting, casing pipes, cutting shoes, etc.	Departmental charges for the well-owner.	Average Departmental Expenditure on Bores including:—
							Supervision and Depreciation charges.
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
10'	500	500	..	9 0 0	15 0 0	....	17 3 0
53'	1,000	1,000	..	28 0 0	28 8 0	....	92 13 0
15'	500	500	..	20 0 0	30 0 0	....	25 12 6
182'	500	500	..	107 4 0	30 0 0	....	312 13 0
80'	1,000	1,000	..	36 0 0	40 0 0	....	137 8 0
20'	500	825	325	21 0 0	68 12 0	20 0 0	34 6 0
88'	500	500	..	39 0 0	38 7 0	....	151 4 0
82'	500	500	..	38 4 0	33 14 0	....	140 15 0
32'-7"	500	500	..	60 0 0	45 0 0	....	56 0 0
40'	500	1,000	500	27 12 0	96 10 0	40 0 0	68 12 0
45'	500	1,000	500	29 6 0	30 0 0	45 0 0	80 5 6
47'	500	500	..	12 8 0	16 0 0	....	80 12 6
40'	500	500	..	7 8 0	10 0 0	....	68 12 0
122'	..	500	500	125 12 0	30 8 0	158 0 0	209 11 0
50'	3,500	4,500	1,000	30 11 0	114 0 0	50 0 0	96 4 0
143'	4,500	5,500	1,000	108 14 0	228 4 0	189 8 0	245 12 6
111'	250	1,250	1,000	140 4 0	177 4 0	141 8 0	190 12 6
97'	500	4,500	4,000	86 2 0	148 0 0	120 8 0	166 11 6
176'	500	500	..	150 0 0	346 0 0	....	302 8 0
116'	500	500	..	33 8 0	30 8 0	....	199 6 0
119'	300	500	..	125 0 0	225 0 0	....	204 8 6

Serial No. of Bores.	Names of well or land-owner.	Survey No.	Name of Taluka.	Name of Village.	Surface bore or well bore with dimensions of well	Diameter of bore.
1	2	3	4	5	6	7
NEW BORES UNDERTAKEN IN 1920-30—<i>contd.</i>						
<i>Surat District—concd.</i>						
9	Suraji Kalaji	...	Sanand	Soyala	33'	3"
10	Ramaji Galaji	...	Do.	Kalana	24'	3"
11	Jothabhai Zanjibhai	129	Do.	Vasna Iva	....	3"
<i>Broach District</i>						
1	Fardunji Rustomji Mohita	...	Ankieswar	Mandva	32'	4"
2	Moharbai Rustomji Pirojsha	307	Broach	Pavra Bet	30'	4"
3	Chhitabhai Ukabhai	338	Do.	Do.	35'	4"

Depth of actual bores.	Water before boring in gallons per hour.	Water after boring in gallons per hour.	Number of gallons increased per hour by boring.	Labour charges.	Cost of fuel, lubricating, coal, gasing, casing, pipes, cutting shoes, etc.	Departmental charges for the well-owner.	Average Departmental Expenditure on the bore including :-
							Supervision and Depreciation charges
6	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
148'	500	2,500	2,000	87 0 0	184 0 0	197 0 0	284 8 0
100'	500	2,500	2,000	51 8 0	148 0 0	125 0 0	173 10 0
34'	..	..	..	....	....	....	55 1 2
44'	1,000	2,000	1,000	29 4 0	101 4 0	44 0 0	75 8 0
80'	500	3,500	3,000	44 8 0	166 4 0	95 0 0	137 8 0
125'	500	500	..	81 6 0	187 4 0	....	214 13 0

Serial No. of Bore.	Names of well or land-owner.	Survey No.	Name of Taluka.	Name of Village.	Surface bore or well bore with dimensions of well.	Ave. Dept. Expenditure etc. —contd.
						Running expenses; Mechanic's wages and repairs.
1	2	3	4	5	6	16
	BORES LEFT INCOMPLETE LAST YEAR AND COMPLETED THIS YEAR.					Rs. a. p.
	<i>Ahmedabad District.</i>					
11 of 1929.	Taluka Local Board, Sanand.	..	Sanand	Rampura	42'	485 14 7
	<i>Surat District</i>					
16 of 1929.	Sardar Faramroz B. Garda.	..	Jalalpore	Jalalpore	Surface	392 10 0
1929-1930	NEW BORES UNDERTAKEN IN 1929-30.					
	<i>Surat District.</i>					
1	Sardar Faramroz B. Gardaji.	..	Jalalpore	Jalalpore	Surface	468 15 6
2	Jehangir B. Gardaji	.. $\frac{223}{4}$	Do.	Do.	Do.	599 14 4
3	Nagarji Naranji	..	Pardi	Pardi	40'	246 0 0
4	Sorabji B. Gardaji	..	Jalalpore	Jalalpore	Surface 19' pit	349 7 4
5	Dorabji Pestonji	.. $\frac{55}{1}$	Do.	Do.	Do. 20' pit	290 13 4
6	Rustomji Bamanji	..	Pardi	Dungri	34'	115 5 0
7	Bhagubhai Dwarkadas	.. 126	Olpad	Sayan	Surface 14' pit	370 6 8
8	Chhotubhai Raychand	..	Pardi	Paria	28'	118 10 0
9	Manekshaw F. Manekshana.	..	Bulsar	Kalmada	33'	176 12 0
10	Chhotubhai Raychand	..	Pardi	Paria	28'	118 5 0
11	Lilachand Virchand	.. 1242	Do.	Do.	23'	57 10 4
12	Dorabji Pestonji Baria	.. 8	Jalalpore	Jalalpore	Surface 18' pit	325 8 10
13	Lilachand Virchand	.. 1242	Pardi	Paria	23'	67 10 6
14	Koli Gandia Kalia	.. 12	Do.	Do.	30'	295 15 6
15	Patel Dahyabhai Premabhai.	.. 648	Bulsar	Kalmada	27'	143 9 9
16	Manibhai Haribhai	.. 481	Bulsar	Atgam	53'	110 7 6
17	Jehangirji H. Madan	.. 83	Chorasi	Tuki	Surface 15' pit	458 6 3
18	Pirojshaw Bhikhaiji Vandreiwala.	.. $\frac{290}{2}$	Jalalpore	Vijalpore	34'	331 0 9

Cost of bores to the well-owners.	Cost per foot for the well-owner.	Total cost of bore inclusive of well-owners' and departmental cost.	Total cost per foot.	Object of boring— whether agricultural or drinking purposes.	Remarks— successful, un- successful, incomplete on hand or abandoned.
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
493 0 0	3 9 7	1,210 11 6	8 13 5	Drinking pur- poses.	Successful.
30 0 0	0 11 10	658 4 0	6 1 6	Gardening ..	Unsuccessful due to accident not removed.
433 11 0	3 5 9	1,127 6 4	8 11 10	Drinking and Gardening.	Successful.
355 0 0	3 3 8	943 15 4	8 9 4	Do. ..	Do.
128 8 0	2 0 2	484 0 0	7 9 1	Agricultural..	Do.
296 15 0	3 3 8	804 8 4	8 11 11	Gardening and Drink- ing.	Do.
255 15 0	3 3 4	684 4 4	8 8 8	Do. ..	Do.
39 12 0	2 15 10	256 10 0	8 8 10	Agricultural..	Do.
340 13 6	4 4 2	848 11 6	10 9 9	Drinking ..	Do.
71 0 0	2 4 8	242 15 6	7 13 4	Agricultural..	Do.
153 8 0	3 3 3	412 12 0	8 9 7	Do. ..	Do.
49 8 0	1 10 5	216 6 0	7 3 5	Do. ..	Do.
30 0 0	2 0 0	113 6 10	7 0 0	Do. ..	Abandoned as tool was sticking in bore hole.
291 2 0	3 4 4	769 10 4	8 10 4	Gardening and Drink- ing.	Successful.
35 0 0	2 5 4	118 7 0	7 14 4	Agricultural..	Abandoned as tool was sticking in bore hole.
60 0 0	0 12 6	488 5 0	6 5 6	Do. ..	Abandoned as fur- ther work could not be done due to unfavourable strata.
155 8 0	4 7 10	366 2 3	9 6 3	Do. ..	Successful.
116 14 0	3 14 4	278 14 6	9 4 9	Do. ..	Do.
422 8 0	4 4 3	1,050 10 1	10 9 8	Drinking ..	Do.
306 0 0	3 6 4	781 11 9	8 11 0	Agricultural..	Do.

Serial No. of Bore.	Names of well or land-owner.	Survey No.	Name of Taluka.	Name of Village.	Surface bore or well bore with dimensions of well.	Ave. Depth. Expenditure on the bore including:—
						Running expenses; Mechanics' wages and repairs. 16
1	2	3	4	5	6	Rs. a. p.
NEW BORES UNDERTAKEN IN 1920-30—contd.						
<i>Surat District—contd.</i>						
19	Chhotubhai Raychand ..	..	Pardi ..	Paria ..	30'	38 7 0
20	Ukabhai Gopalji ..	..	Bulsar ..	Jujma ..	43'	198 13 6
21	Chhotubhai Raychand ..	..	Pardi ..	Paria ..	30'	57 10 6
22	Koli Soma Prema ..	109	Jalalpore ..	Karadi ..	20'	661 10 4
23	Ranchhodhbhai Naranji ..	77 5+7	Pardi ..	Dungari ..	35'	307 8 0
24	Sheth Paragji Virochand ..	414	Bulsar ..	Jujma ..	38'	74 1 0
25	Govindbhai Vallabhbbhai ..	272	Do. ..	Thakarwada ..	40'	324 0 8
26	Nichhabhai Fakirbhai ..	..	Do. ..	Do. ..	43'	301 15 2
27	Bhanabbhai Govindbhai ..	366	Do. ..	Jujma ..	45'	120 10 7
28	Ranchhodhbhai Rattanji ..	..	Bulsar ..	Padaria ..	37'	147 4 8
29	Dajibhai Naranbbhai ..	..	Bulsar ..	Jujma ..	52'	116 11 3
30	Rustomji Bhamaji Avasia.	..	Pardi ..	Dungari ..	35'	170 10 6
31	Haria Harkha ..	..	Do. ..	Do. ..	30'	153 12 0
<i>Ahmedabad District</i>						
1	Taluka Local Board Sanand (Dharamshaja).	..	Sanand ..	Chharodi ..	Surface ..	432 11 6
2	Vallabbhai Shivabbhai ..	353	North Daskroi ..	Gota ..	57'	216 11 4
3	Do. do. ..	353	Do. ..	Do. ..	57'	553 6 1
4	Taluka Local Board, Sanand.	..	Sanand ..	Kalapa ..	16'	393 11 3
5	Ganabbhai Sherkhan ..	..	Do. ..	Do. ..	39'	344 0 9
6	Udyoga Mandir ..	..	North Daskroi ..	Sabarmati ..	50'	681 1 4
7	Suraji Kalaji ..	..	Sanand ..	Sayala ..	33'	411 7 0
8	Gujarat Vidyapith ..	218 to 220	North Daskroi ..	Navrangpur ..	40'	460 8 1

Cost of bore to the well-owners.	Cost per foot to the well-owner.	Total cost of bore inclusive of well-owners' and departmental cost.	Total cost per foot.	Object of boring—whether agricultural or drinking purposes.	Remarks—successful, unsuccessful, incomplete on hand or abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
24 0 0	2 6 4	79 10 0	7 15 5	Agricultural..	Abandoned due to unfavourable strata.
56 8 0	1 0 9	348 2 6	6 7 2	Do. ..	Abandoned due to unfavourable strata and hard rock.
50 0 0	3 5 4	133 7 0	3 14 4	Do. ..	Do.
137 4 0	0 12 1	1,111 11 4	6 1 9	Do. ..	Unsuccessful as water tapped saltish.
76 0 0	0 15 3	521 0 0	6 8 2	Do. ..	Abandoned due to hard rock.
100 12 0	5 7 9	218 3 0	10 14 7	Do. ..	Successful.
77 7 0	0 14 1	552 11 8	5 4 6	Do. ..	Abandoned due to hard rock.
72 2 0	0 14 1	515 0 2	6 4 6	Do. ..	Do.
105 0 0	3 3 3	281 10 9	3 10 8	Do. ..	Do.
164 6 0	4 1 9	390 6 7	9 8 2	Do. ..	Successful.
102 6 0	2 4 5	246 6 9	7 7 7	Do. ..	Do.
28 8 0	0 9 8	279 15 0	5 15 4	Do. ..	Abandoned due to hard rock.
17 8 0	0 7 0	240 0 0	6 0 0	Do. ..	Do.
314 4 0	2 9 3	956 10 6	7 13 4	Drinking ..	Successful.
208 14 0	3 19 3	516 13 4	9 3 8	Agricultural.	Successful.
526 10 0	3 10 11	1,325 12 7	9 5 0	Do. ..	Do.
450 0 0	4 2 2	1,043 7 9	9 6 5	Drinking ..	Do.
354 10 0	3 10 6	865 6 3	8 14 9	Agricultural..	Do.
496 0 0	2 13 1	1,479 9 4	8 6 6	Do. ..	Unsuccessful as even the size of reduced pipes could not be driven further though hammered.
64 0 0	0 8 10	674 13 0	5 13 1	Do. ..	Unsuccessful due to accident not recovered.
350 0 0	2 15 1	1,015 0 7	8 8 6	Drinking. ..	Unsuccessful as accident not recovered.

Serial No. of Bores.	Names of well or land-owner.	Survey No.	Name of Taluka.	Name of Village.	Surface bore or well bore with dimensions of well.	Ave. Deptl. Expendi- ture, etc. — <i>contd.</i> Running expenses, Mecha- nics, wages and repairs.
1	2	3	4	5	6	16
	NEW BORES UNDERTAKEN IN 1929-30—<i>contd.</i>					Rs. a. p.
	<i>Ahmedabad District—contd.</i>					
9	Suraji Kalaji	..	Sanand ..	Soyala ..	32'	524 15 0
10	Ramaji Galaji	..	Do. ..	Kalawa ..	24'	354 11 0
11	Jethabhai Zanjibhai ..	129	Do. ..	Vasna Iva ..	....	120 9 3
	<i>Branch District.</i>					
1	Fardunji Rustomji Mehta ..	..	Ankleshwar ..	Mandva ..	33'	162 15 0
2	Moharbai Rustomji Pirojsha.	307	Branch ..	Tavra Bet ..	30'	296 4 0
3	Ohhitabhai Ukabhai ..	338	Do. ..	Do. ..	35'	462 14 3

Cost of bores to the well-owners.	Cost per foot to the well-owner.	Total cost of bore inclusive of well-owners' and departmental cost.	Total cost per foot.	Object of boring— whether agricultural or drinking purposes.	Remarks— successful, un- successful, incomplete on hand, or abandoned.
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
468 0 0	3 2 7	1,247 5 0	3 6 10	Agricultural	Successful.
322 8 0	3 3 7	850 13 0	3 8 2	Do.	Do.
....	....	....	....	Do.	Incomplete.
174 8 0	3 15 5	412 15 0	9 6 2	Agricultural	Successful.
304 12 0	3 12 11	738 8 0	9 3 9	Do.	Do.
268 10 0	2 2 5	946 5 9	7 9 1	Do.	Unsuccessful as water tapped saltish.

Results of Bores made in Gujarat in

No.	Names of District.	Incomplete bores of last year completed in this year.	New bores undertaken.	Bores successful.	Bores unsuccessful		
					Abandoned due to unfavourable strata.	Failed as water tapped salish.	Failed as accident met with not recovered.
1	2	3	4	5	6	7	8
1	Surat ..	1	31	18	12	1	1
2	Ahmedabad ..	1	11	8	..	..	2
3	Broach ..	..	3	2	..	1	..
	Total ..	2	45	28	12	2	3
						Percentage of	

1929-30 (Year ending June 1930).

ful. Failed as pipes could not go far- ther. 9	Total number of un- successful bores. 10	Bores incomplete. 11	Total number of Bores undertaken. 12	Total depth bored. 13	Total number of Gallons of water tapped. 14	Remarks. 15
....	14	....	32	1,883'-7"	15,825	
1	3	1	12	1,250'-0"	12,500	
....	1	....	3	249'-0"	400	
1	18	1	47	3,391'-7"	32,325	
success is 60.87 per cent.						

C. S. PATEL,
Deputy Director of Agriculture, Gujarat.

APPENDIX G

SUMMARY OF WORK DONE UNDER THE DEPUTY DIRECTOR
OF AGRICULTURE, KONKAN DIVISION, RATNAGIRI,
FOR THE YEAR 1929-30

I—Staff

Mr. V. V. Gadgil was in charge of this Division throughout the whole year. The staff of this Division consisted of :—

18 Graduate Assistants.

13 Non-graduate Assistants.

Five Kamgars engaged in District Propaganda Work. Besides there is one Boring Assistant, 10 Mechanics and 7 Mates engaged in boring section of the Konkan Division.

The work of the Konkan Division is summarised under the following heads :—

- I. Research Work.
- II. Propaganda Work.
- III. Agricultural Organisation.
- IV. Agricultural Service.
- V. Agricultural Education.

Season

2. The total rainfall recorded during the year at the head quarters of the four districts was as follows :—

Kanara	..	..	..	149·60 inches.
Ratnagiri	..	..	..	91·91 inches.
Kolaba ..	..	..	..	73·63 inches.
Thana ..	..	..	..	69·69 inches.

In the Kanara District regular monsoon commenced by the end of May and extended in the north, on the 3rd of June in Ratnagiri and on the 6th of June in the Kolaba and Thana Districts. In the beginning, the rainfall was very heavy and affected the rice seed-beds in many places. The seed did not germinate and second sowing with sprouted seed had to be arranged. The prices of seedlings were enormously increased on account of their shortage. The fall of rain in the month of June and July continued to be heavy in the Kanara and Ratnagiri Districts. In Kanara there were heavy floods and washings due to excessive rains and the field operations had to be suspended till the middle of July. In Thana and Kolaba Districts the fall of rain was just sufficient to commence transplanting of rice in proper time. In the month of August, light showers were received throughout the Konkan Division which were beneficial to the rice crop in Thana and Kolaba Districts. In the first fortnight of September there was practically a break followed by light showers in the second fortnight. In the month of October heavy showers were recorded in Kanara and Ratnagiri Districts which

were detrimental to the growth of rice seed formation and as a result the crop was much below the normal. The late rain also interfered with the harvest of early rice and *supari*. In Kolaba and Thana Districts although the rainfall was below the average, its distribution was very favourable for profuse tillering and grain formation and as a result heavy yields were expected.

In the north Konkan the *rabi* season was marked with occasional showers in December and February which were injurious to the crop. The heavy rains in the months of October and November also delayed the sowing operations of *rabi* crop in Ratnagiri District as the fields were moist till late in the season and hence the yields of the *rabi* crops were very low. On the whole the *kharif* season was fairly good for Thana and Kolaba while it was not satisfactory for Ratnagiri and Kanara Districts. The *rabi* season was far from satisfactory.

During the year under report there was a severe attack of kanepest (Patchy Deplois oryzen) on the rice crop of Kanara District and the damage varied from 15 to 25 per cent throughout the district. In the Ratnagiri District complaints were received against the attack of rice borer in Sangmeshwar and Chiplun Talukas, but in the remaining parts the rice crop was practically free from any insect attack. On account of late rains the mango trees had produced excessive leafy growth and there was very little chance of producing inflorescence; but on account of the continuous cold weather from the middle of December to the beginning of February most of the plants have produced profuse flowers. The attack of mango hopper was, however, very severe and it destroyed all the complete flowers. There were three flushes in December, January and February. The first of which was completely damaged by hoppers. What little crop was received was from second and third flush which was practically free from the attack of mildew. On the whole the mango crop could not be valued for more than seven annas.

During the year the koleroga disease on *supari* (betelnut) was as severe as in the past in the month of June and July. The serious damage caused by the droppings of nuts made the gardeners to undertake spraying on a large scale.

I. Research and Experiments

(1) Rice

3. *Rice breeding and selection.*—In the last year's report the necessity of starting breeding and selection work for Ratnagiri and Kumta Farms independently has been clearly mentioned. Uptil now the selection and breeding of rice was continued in the old system without introducing the scientific methods of testing the different strains by Fisher's method or by Student's method and extra attention was paid to the measurements of individual plant without knowing whether a particular strain is really superior to the local check. As a result good many strains had to be rejected when they are tried on a field scale. Since this matter had

been discussed in the Crop Research Committee and future lines of actions were chalked out the whole work is now reorganised on the latest scientific basis and all the new strains are now tried by Fisher's, Student's, Chess board or Latin's square method during the year under report. On the Ratnagiri Farm *kudai* No. 25, 42 and *patni* No. 6 were tried in uplands by Fisher's method in four replications along with the local *patni* check. The formation of grain was interfered by the heavy rains of October and consequently there was high percentage of sterility. From the results it can be stated that strain No. 6 has given 23 per cent higher yield over the local *patni* check and the result is very significant. Strains No. 25 and 42 have given only 7 per cent and 2 per cent higher yield respectively over the local *patni* check and hence none of them were significant. When the same strains were tried in a slightly low situation heavy yields have been obtained over the local check. The increased outturn varies from 60 and 54 per cent in the case of strain No. 25 and 42 over the local check and the results are most significant. From these facts it may be remarked that both these strains, viz., 25 and 42, are not very suitable for high uplands but are remarkably suitable for slightly lower situations. The name *patni* is given to several early and intermediate types of coarse rice and hence the introduction of 2 or 3 strains from early to intermediate types is necessary. A thorough trial will be given to these strains both on the farm and in the district before deciding which strain will be suitable in a particular tract.

4. Among the intermediate strains, Panwel No. 61 was compared with local *vaksal* by the A. B. B. A. method and the results are very encouraging. Although this strain was somewhat affected by borer it has given nearly 15 per cent more yield than the local *vaksal*. In the district also this strain has been very much appreciated in the northern part of the Ratnagiri District where it had given from 15 to 25 per cent increased yield over the local check. All the available seed has now been supplied to the registered seed growers for propagation under the supervision of the Department.

5. The necessity of the Sakharpa Sub-station for the trial of intermediate and late strains has been mentioned on page 134 of the last year's report. At Sakharpa the intermediate strain Nos. Panwel 60 and 61 and *bhadas* No. 79 were tried along with the local *vaksal* but on account of severe attack of the borer the results were vitiated. On the same farm the late strains 92, 98 and 198 were also tried by Fisher's method in four replications along with the *varangal* check and they yielded 35 per cent, 25 per cent and 15 per cent increased outturn over the local check. All these strains are very significant and they will be tried on a large scale during the next season.

6. During this year there was a severe attack of kanne-pest on the Kumta Farm and consequently the correct results could not be ascertained. Selection work of different varieties of rice, mentioned on page 134 of the last year's report, was further continued. Among the early varieties strains No. 1061, 1012 and 1315 have given 19 to 24 per cent increased yield over the *maskati* check and these will be further

propagated for introducing in the district. Among the 95 selections of *halga* variety only one strain No. 204 has given increased yield and it will be tried in the next year. Out of the promising late strains of the year 1926-27, strains No. 1501 and 1548 have given appreciable increased yield and they will be tried on a field scale.

7. *Rice Research at Karjat.*—As mentioned in last year's report the object of investigation at the Karjat Rice Research Station is to increase the yield of rice by means other than breeding which must be both economical and within the reach of an ordinary cultivator. So far amongst the inorganic fertilisers, sulphate of ammonia has proved of immense value in giving the larger increase in rice outturns. It was found out that the application of 300 lbs. of sulphate of ammonia per acre gave the maximum yield (4,087 lbs.) under the field conditions as against 2,719 lbs. from the no manure plot. Thus the percentage of increase was 37.

8. With the object of finding out the exact time for the application of this manure, an experiment has been in progress for the last five years. According to the plant's chemical activity, the Agricultural Chemist found three stages at which, if artificial manure was made available to the plant, namely, (1) at tillering, (2) at pre-flowering and (3) at flowering, maximum yield is expected. During the year under report an experiment was conducted to find out in what way sulphate of ammonia influences the rice plant in the above stages. 20 lbs. N. in the form of sulphate of ammonia was applied per acre only (1) at the time of tillering (2) at the time of pre-flowering and (3) at the time of flowering stage and it was observed that there was very little difference in the yield if the manure was applied at any of the above mentioned stages. From this it can be inferred that if the tillering dose is going to increase the number of ear bearing culms and if the pre-flowering dose is going to increase the weight of the individual earhead there is no necessity of giving the third dose at flowering stage.

9. It is presumed that the continuous application of the sulphate of ammonia to the rice fields may reduce the calcium carbonate contents in the soil and consequently the efficiency of sulphate of ammonia will be reduced. To verify this statement a separate plot is assigned to this experiment and the observations will be recorded from year to year.

10. As mentioned on page 135 of the last year's report, an experiment to get the highest yield from the given quantity of manure by changing the number of seedlings per bunch is in progress for the last two years. Last year 8 and 12 culms per bunch gave better results than 4 culms. This year 4 culms in a bunch has given higher yield probably due to the profuse tillering which was a special characteristic of this year's season of well distributed rains. The proportion of grain to straw however increases with the increased number of culms per bunch.

11. It was suggested that the form of nitrogenous manure such as organic or inorganic had shown effect on the average weight of the rice

earhead. It was thought that the same amount of nitrogen in the form of organic manures increases the weight of the earhead than the same amount of nitrogen given in the form of inorganic manure. In order to verify this statement an experiment is in progress for the last three seasons and it is now finally concluded that the weight of the earhead is not at all affected by the form of manure.

12. Calcium cyanamide was given a thorough trial in pots as well as in plots and also in the cultivators' fields and everywhere it was found that calcium cyanamide is not going to compete with sulphate of ammonia in trap soils.

13. The addition of green leaves of *Ipomea cernia* was tried in the fields for transplanted rice and it was observed that about four to five thousand lbs. of green matter can be added per acre by planting sets in the harvested fields and allowing them to grow *in situ* till puddling and then burying them into the soil. The effect of this manure was seen in increasing the yield by 25 per cent over the no manure plot. The combination of this green manure with sulphate of ammonia is also promising.

14. In rice, lodging of the crop reduces the yield by about 20 per cent. under the normal conditions. It was therefore thought that strong stemmed strains than the present *kolamba* No. 42 will overcome the above difficulty. Accordingly strain No. 412 was compared with K42 both under 60 lbs. of N. and 100 lbs. of N. in the form of sulphate of ammonia per acre and it was observed that under both the treatments strain No. 412 stood erect while K42 lodged. In point of growth both the strains behave similarly. But strain No. 412 gave more outturns in grain and straw. The figures of outturns being the highest records on the Karjat Research Station are given below :—

Treatment per acre	Average yield of 4 replications per acre		Remarks
	Grain	Straw	
	Lbs.	Lbs.	
60 lbs. N. per acre strain No. K42	3,769	4,303	
60 lbs. N. per acre strain No. 412 ..	3,912	4,920	
100 lbs. N. per acre strain No. K42 ..	38,88	4,610	
100 lbs. N. per acre strain No. 412 ..	4,560	4,780	

These results reveal that strain No. 412 is very promising and its grain is also finer than K42.

15. It was thought that nitrate of soda had better effects on the rice plant if given at the latest stage, i.e., at flowering, than sulphate of ammonia. But this year's results have shown that the rice plant had no special liking for nitrate of soda at the latest stage. On the contrary the sulphate of ammonia given at the flowering stage has increased the yield by 5 per cent over the nitrate of soda.

16. As mentioned in paragraph 2 of page 135 of the last year's report, an experiment is in progress to find out the various losses of N through drainage, overflow and crop, etc. The total unaccountable loss this year is only 17 per cent as against 27 per cent of the last year and this may be due to the well distribution of rainfall which enabled the plant to assimilate more nitrogen.

(2) *Nagli*

17. The breeding of *nagli* strain was continued at Hatkhamba Sub-station and the following four strains were tested by the Fisher's method in four replications along with the local *kalperi* check. The crop was badly damaged by rats but in spite of this attack the strain No. E31 has given 21 per cent more yield than the local *kalperi*. B1 which is the earliest of all has given 5.6 per cent increased yield while A16 and B82 have given an increased yield up to 4 per cent. All these strains are very useful for different tract of Konkan Division and all the available seed has now been given to the registered seed growers for propagation.

18. Manurial experiments conducted on *nagli* tend to show that a combination of 80 lbs. of sulphate of ammonia and one cwt. of bone-meal has increased the yield by 112 per cent while fish manure stands second in order of merit, the percentage of increase being 110 per cent. over the no manure plot. Sulphate of ammonia alone does not respond properly as the increased yield was only 51 per cent. The local system of manuring of *nagli* is only with fish manure. But as its prices fluctuate very widely according to the availability of manures in different years it is quite risky to depend solely on fish manure. People have, therefore, adopted the application of bone-meal and sulphate of ammonia on a large scale.

(3) *Sugarcane*

19. As mentioned on page 137 of the last year's report, manurial and varietal experiments of sugarcane were conducted on Kumta Farm. Total nitrogen added to sugarcane was 150 lbs. per acre half of which was given in the form of f. y. m. and other half in the form of concentrated manures as top dressings. The system of adding half the nitrogen in the form of oil-cakes and other half in the form of sulphate of ammonia and bone-meal was introduced by the first time on Kumta Farm according to the Manjri system. The application of sulphate of ammonia and *undi*-cake has given higher yield of 11,500 lbs. liquid gul in the whole series. The plots manured with sulphate of ammonia and bone-meal or bone-meal alone stands second in order of merit. From the results it is quite clear that the sulphate of ammonia alone is not so effective on sugarcane in Kanara soils. This observation confirms the remarks made last year. From the general observation of the sugarcane crop of the Kanara District it is quite clear that the cane does not ripen within twelve months of its growth and the reading of Brix is below 16 degrees. As a matter of fact good deal of sugar contents is lost on account of unripe cane. A new method of planting canes in December and

harvesting the same in the month of February, i.e., after 14 months, has now been adopted in order to solve this difficulty and it is presumed that it will increase the outturn to a considerable extent. The early planting will also produce more number of tillers which are quite essential for high outturn.

20. Seven varieties of sugarcane were tried on a fairly large scale out of which H.M. 544 has given the highest outturn, viz., 13,030 lbs. of liquid gul per acre. Mauritius No. 55 has given 12,485 lbs. of gul while Red Mauritius stands third in order. The local cane Daskabbu had been badly affected by red rot and consequently the yield was very poor, namely, 6,710 lb. In the District of Kanara, Red Mauritius has now replaced nearly 50 per cent of the local variety Daskabbu and probably the introduction of H.M. 544 will occupy major portion of the sugarcane area. Both the new varieties, however, require more than 13 months for full ripening and hence the new system of planting canes in December and harvesting in February will be most beneficial.

(4) *Cocoanut*

21. As mentioned on page 138 of the last year's report, manurial experiments on cocoanut were conducted in the village Hedge about five miles from the Kumta Farm. This is the fourth year of this manurial trial and the summary of the results is given below.

The mixture of 4 lbs. of bone-meal, 4 lbs. of *undi*-cake, one lb. of sulphate of potash and one lb. of denaturalised salt was given per tree of cocoanut in the month of September and the average results of the four year's trial will be seen in increasing the yield by 36.1 per cent in one series and 47.5 per cent in the second series over the local system of manuring. The cost of manure per tree is only eight annas and the net profit varies from Re. 1 to Re. 1-7-0 per tree over the local check.

(5) *Mango*

22. This is the fifth year of the mango investigation conducted at Ratnagiri Farm with the help of the Sir Sasoon David Trust Fund. It has been definitely proved that the mango hoppers and mildew are the principal agencies which materially damage the mango crop. As stated in the chapter on Season, there was a profuse flowering of mangoes on account of continuous cold weather but it was accompanied by a very severe attack of jassid hoppers in the month of January 1930. The second flush of flower was almost free from hoppers but it was affected by mildew.

23. Out of the three species of jassid hoppers *I. clypealis* breeds only once in the season but very frequently when the flowering is profuse. *I. niveusparsus* breeds almost throughout the season but numerically they are considerably less than the former. The third species *I. atkinsoni* breeds only occasionally on the blossom. Out of these the first species is really dangerous and destroys a major portion of mango inflorescence.

24. During the year under report all the remedies mentioned on page 139 of the last year's report were tried on an extensive scale by taking whole block of 20 trees for each treatment. A similar block of untreated trees was also kept under observation. A careful data was recorded about the material and labour required for each treatment and about the extent of hopper infection of treated and untreated trees. The yields from all the treated and untreated trees were also separately recorded. Out of the three flushes, the first two flushes in the months of January and February produced nearly seven-eighths of the total blossom which are badly attacked by hoppers and mildew. The third flush was very poor but was almost free from the attack. The hoppers caused a damage to the extent of 60 per cent. The mildew damaged the crop only to 5 per cent during this year.

25. The results of dusting and spraying are given in the following statement :—

Serial No.	Name of treatment	Cost of treatment per 1,000 flower heads	Cost of treatment per tree	Percentage of increase of fruits over control	Net profit per 1,000 flower heads treated	Net profit per tree
		Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
1	Sulphur 3 dustings	0 11 11	1 0 0	216.04	5 10 0	7 8 0
2	2 dustings of sulphur and 1 of sulphur cyanide mixture 6:1.	1 14 0	2 4 0	208.13	4 0 0	4 12 0
3	Sulphur tobacco mixture 5:1.3 dustings.	1 15 8	0 5 1*	105.78	2 0 0	0 10 0
4	Bordeaux mixture 5-5-50 .3 dustings.	1 5 4	1 8 0	136.18	3 0 0	3 6 0

* These trees were very small in size being 10 to 12 years of age while all the rest were 25 to 30 years old and hence the cost of treatment is very low.

26. From the above results it will be seen that sulphur treatment is the cheapest and most effective. It is very simple in application and is not attended with any risk like the cyanide dust. It is a specific against mildew and an effective deterrent against the hoppers. Even in bad cases of infection the nymphs generally drop off within 3 to 4 days after treatment. The smell of sulphur drives away the adults and there is very little egg-laying on the treated flower heads. Three thorough dustings have to be given during the season; the first soon after the emergence of the flowerheads and the other two followed after the interval of a fortnight. At a cost of about one rupee a normal crop is ensured.

27. The dusting was mainly done with the American Peerless dust gun supplied by Messrs. Dharamsi Morarji Chemical Co. of Bombay. With this machine dusting can be done to a height of 12 feet. During

the year a step ladder with a platform on the top was specially prepared for dusting tall trees and it was found that dusting can be done to a height of 20 feet with this ladder. Necessity of a power duster is however felt to dust the trees of taller heights and this problem will be tackled in the next season. For dusting a tree of average height (20 feet) 12 to 15 lbs. of sulphur is required for three dustings.

28. During the year under report some experiments were made on the regulation of mango flowering. The mango trees usually bear in alternate years in Konkan. A few grafts of about 12 years old, which have borne fruit last year, were manured in June 1929 with four lbs. of sulphate of ammonia and 200 lbs. of farm yard manure. They produce vegetative growth in October and flowered in February 1930. The trees producing vegetative growth in October generally do not flower that season. A few branches of these trees have their October shoots completely pruned early in January and they produce flower heads. From these facts, it seems that it would be possible to make the tree bear every year. Pruning of the vegetative shoots will make the tree flower in January and manuring will help to bring early blossoms of trees which have not produced October vegetative shoots. Pruning of new shoots is more advantageous than ringing the old branch which causes permanent injury to the plant.

(6) *Crabs*

29. During this year, the work on crab was chiefly devoted to the several water poisons and fumigants likely to be effective against crabs. The trials were first made in the laboratory in glass jars and meshed tubes. The water poisons like potassium cyanide, sodium arsenate and copper sulphate were not successful in the fields. Out of the fumigants calcium cyanide has been found unsuccessful even in large doses of 4.5 to 6.0 grammes per burrow probably due to the fumes being soluble in water. Carbon bisulphide (dose 0.7 grammes per burrow) and seekay fumigant (dose 1.5 grammes per burrow) have been found very promising, the former by the end of September and the latter earlier in the season, the percentages of success in the fields being 60 and 45 respectively. In the combination trials of water poisons and fumigants, it was noticed that on the whole the water poisons have not enhanced the value of the fumigants to any appreciable extent; the only exception being potassium cyanide which slightly improved the efficacy of the fumigants. Thus the percentages of success with the combination of potassium cyanide and carbon bisulphide or seekay fumigants came to 80 and 60 per cent respectively. It was observed that crabs find it necessary to move in and out of water even if the water and the atmosphere above are poisoned. The zigzag nature of the burrow retards the diffusion of the gas and thus hampers the efficacy of the fumigants.

30. The method of trapping crabs in earthen pots as practised in Madras was not found very effective unless some attractive baits were placed in the pots. In order to ascertain the average volume of a burrow, twelve burrows were dug up and their volumes recorded. The average volume comes to 68.89 c.c.

II. Propaganda

31. The principal items of the programmes of the District Staff consisted of the following :—

32. (1) *Introduction of improved and high yielding rice strains.*—The new scheme of introducing the improved strains of rice and the distribution through the registered seed growers mentioned on pages 143 and 144 of the last year's report has worked very satisfactory during the year under report. It has saved a lot of botheration of the credit sales at a high cost and their recoveries after the harvest and the District Staff is now able to devote more attention to their legitimate duties. So far the distribution of rice is concerned, the Konkan Division is divided into three groups, viz. (1) Thana and Kolaba tract, (2) Ratnagiri tract and (3) Kanara tract. In the first tract the following quantities of seed were supplied to 61 registered seed growers from the Karjat Research Station, Karjat Breeding Station and the Jambul School Farm :—

Kolamba 42	..	..	..	10,100 lbs.
Kolamba 79	..	..	..	2,240 lbs.
Kolamba 226	..	..	..	800 lbs.
Kolamba 184	..	..	..	200 lbs.

The total area under these strains was about 400 acres which was carefully purified and its produce was kept for general distribution during the year 1930. The total produce realised from this area was about six lakhs of lbs., more than half of which has been utilised for seed purpose during the year 1930-31 for an area of 10,000 acres. Thus it will be seen that with the present system of pure seed distribution the Department can supply pure seed of the improved strains of rice for an area over ten thousand acres annually. As new seed growers and new villages are generally selected every year and as the purity of the seed is assured for a period of three years, it is quite possible to cover the whole rice area under *kolamba* of improved strains in a few years. For the distribution of the seed from the stock of the registered seed growers the following agencies were utilised :—

- (1) Taluka Development Associations.
- (2) Trade agencies.
- (3) Dealers in rice seed.
- (4) Seed societies.
- (5) Grain Banks.

During the year 1930 the following quantities of seeds have been supplied to the registered seed growers from the Government Farms :—

Kolamba 42	..	..	..	15,660 lbs.
Kolamba 79	..	..	..	2,060 lbs.
Kolamba 184	..	..	..	1,035 lbs.
Kolamba 226	..	..	..	2,240 lbs.

The total area of rice under the registered seed growers during the year 1930-31 will be 650 acres. Besides these the Taluka Development Associations of Roha, Mahad, Palghar, Dahanu and Umbergaon have

arranged their own registered seed growers for supply of pure seed in those talukas and the exact quantity of seed distributed by them is yet to be ascertained.

33. With regard to the suitability of the new strains in Thana and Kolaba Districts, this point was discussed in the Crop Research Committee and it was settled to concentrate more attention to the distribution of the following new strains :—

Kolamba 226 which is superior in quality in yield to *kolamba* 42, to be specially distributed in North Thana.

Kolamba 184 should replace *kolamba* 79 which is badly affected by storage pest.

Kolamba 153 which is intermediate in type to be introduced in the medium tract.

Kolamba 401 which is specially suited for uplands to be introduced in *kuryat* lands.

34. In the Ratnagiri District, the following strains were supplied to the 36 registered seed growers during the year 1929 :—

1,280 lbs. of *kudai* 25.

1,175 lbs. of *kudai* 42.

400 lbs. of *Panwel* 61.

200 lbs. of *kolamba* 79.

The seed was sufficient for 50 acres. Out of these strains *kudai* Nos. 25 and 42 were badly affected by the late rain and a good deal of their produce was found unsuitable for seed purposes. *Panwel* 61 and *kolamba* 79 behaved fairly well and the produce of the same, viz. 15,000 lbs. have been distributed to the general cultivators for 250 acres.

During the year 1930 the following quantities of the seeds have been supplied to the registered seed growers :—

<i>Kudai</i> 25	.. ..	1,600 lbs.
<i>Kudai</i> 42	.. ..	1,000 lbs.
<i>Panwel</i> 61	.. ..	1,200 lbs.
<i>Kolamba</i> 79	.. ..	800 lbs.

The above seed is sufficient for 60 acres.

35. In the Kanara District the work of evolving new strains is still under preliminary stages and hence the distribution of *maskati* and *halga* rice selected from mass selection was continued through the Taluka Development Associations and Agricultural Requisite Societies. During the year under report 24,500 lbs. of *halga* and 7,500 lbs. of *maskati* have been distributed which covered the area of 350 and 100 acres respectively.

36. (2) *Introduction of improved nagli strains.*—As mentioned on page 144 of the last year's report, introduction of improved strains of *nagli*, viz. A 16, B 11, E 31 and E 82 was continued during the year under report and about 400 lbs. of these strains were distributed to the registered seed growers. A beginning has been made to introduce the system of

registered seed growers for this seed on the lines of rice distribution. In Ratnagiri District, eight seed growers were selected for the propagation of E 31, E 82 and B 11 and the seed produced by them has been distributed in the Sangmeshwar and Chiplun Talukas for 100 acres. In South Thana, E 31 has been found more advantageous and its seed was distributed in seven villages. In Kolaba District, B 11 which is an early variety was much appreciated by the public and arrangement has been made to distribute 200 lbs. of the seed to the registered seed growers. In the coastal talukas of the Ratnagiri District, cultivators are in need of very early varieties and about 200 lbs. of B 11 and E 44 have been distributed in this tract. In all 850 lbs. of seed of *nagli* strains have been distributed to the registered seed growers in the year 1930.

37. (3) *Manures*.—As mentioned on page 145 of the last year's report, the artificial manures are attracting the attention of the cultivators both as a *rab* substitute and field manure to the rice crop. As a result of several demonstrations of the use of sulphate of ammonia as a *rab* substitute, 26 tons of this manure were sold during the year. Besides this 76 tons of sulphate of ammonia were distributed in the Thana and Kolaba Districts for field manure. The Imperial Chemical Industries (India), Ltd., have now opened their own depots in all the principal tracts and the people are directly taking advantage of them. The sulphate of ammonia has proved its superiority in all the demonstration plots in trap and laterite soils and the increased yield varies from 20 to 40 per cent. In the tracts of Kanara, bone-meal was found more advantageous for rice crop and 30 tons of this stuff have been sold during the year. The mixture of bone-meal and ammonium sulphate is found more profitable to the *nagli* crop and 8 tons of this mixture have been distributed. Experiments with ammophos have proved successful in the stiff black soil of the North Thana District, and 4 tons of this manure have been utilised for rice crop. For sugarcane crop of Kanara District, a dose of 2 cwt. of bone-meal and 1 cwt. of sulphate of ammonia has been found profitable and the Agricultural Requisite Society of Siddapur and the Taluka Development Association, Sirsi, have sold 8 tons of this manure. During the year under report the following quantities of artificial manures have been distributed through the Departmental agency :—

Sulphate of ammonia	..	102 tons.
Bone-meal	..	45 tons.
Superphosphate	..	11 tons.
Ammophos	..	7 tons.

38. As mentioned in the last year's report, extensive trials of ammophos and calcium cyanamide were made in all the districts of Konkan. Sixty plots with ammophos and twenty plots of calcium cyanamide were conducted in consultation with the Indo Agri, Ltd., which supplied the manure free of cost. From the results it can be remarked that 1 cwt. of ammophos has proved advantageous in all the tracts and the increased yield varied from 25 to 80 per cent. This manure has responded more favourably on the poor soils of Ratnagiri and Kanara

Districts. The only objection to introduce this manure is its prohibitive cost, viz. Rs. 240 per ton. Twenty plots of calcium cyanamide were also arranged in stiff soil of Thana and Kolaba and in the laterite and granite soils of Ratnagiri and Kanara. The results are not so encouraging when compared with those of ammophos. Increased yield over no manure plot varied from 25 to 40 per cent and hence this manure could not be favourably compared with sulphate of ammonia.

39. During the year under report, a demonstration of manufacturing poudrette was further accelerated and small subsidies were granted to the Ratnagiri City Municipality and the Village Panchayats of Karjat and Palghar. The Roha and Pen Municipalities have now applied the poudrette to the rice crop and the results will be available in the next year.

40. (4) *Denaturalised salt.*—During the year under report, licenses for 3,960 maunds of denaturalised salt were issued. The Salt Department has further reduced the price from ten annas to eight annas per maund as they realised profit in this transaction. The G. R. of the reduced rates, however, was received late in the season and hence the people could not fully take advantage of the reduced price.

41. (5) *Implement and Machinery.*—During this year 19 iron ploughs, 38 Bulsar rahats, 6 pumping plants, 14 cane crushers, 6 iron pans, 12 Norcross hand hoes, 12 Peerless dust guns, 60 sprayers and 6 bundles of wire fencing were supplied by the Department to the public.

42. (6) *Breeding bulls.*—There is no change in the five premium bulls kept in different localities of this Division as stated on page 146 of the last years report. Each breeding bull is given Rs. 10 per month for maintenance. These five bulls kept at Killar, Mulund, Maroli, Umbergaon and Saphala have covered 31, 34, 23, 19 and 10 cows respectively during the year. Besides the bull given to the Dombivali Goshala has served 45 cows. During the year the Sindhi bull kept at Kumta Farm has been transferred to Ratnagiri while one buffalo bull is sent to Kumta in exchange. The buffalo at Ratnagiri Farm has covered 129 she-buffaloes during the year.

43. (7) *Organisation of Dairy District in Palghar Taluka.*—During the year under report, the survey of the grass areas in Palghar Taluka was completed and a scheme for organising a Dairy District in Palghar for the supply of milk to Bombay was submitted to Government. A preliminary meeting to discuss the scheme was held in Bombay on 31st of August 1929 under the Chairmanship of the Honourable Minister of Agriculture and the Deputy Director was asked to prepare plans and estimates of erecting a sanitary shed for 500 cattle. Accordingly four sites have been selected for the dairy centres and the plans and estimates have now been submitted to Government. The Government decision about the leasing of the grass area is anxiously awaited as the public is very keen in starting this work.

44. (8) *Spraying against koleroga*.—The work of spraying betelnut trees against the koleroga disease is being conducted in Kanara for the last ten years but the progress of this spraying work was very limited. In order to facilitate this work and to encourage the progressive cultivators to adopt this method, a special grant of Rs. 2,460 was given to undertake this spraying work on a large scale. Two Non-graduate Assistants were specially appointed for this work and every kind of facility was given to the cultivators by supplying the spraying materials and the sprayers and by arranging training classes for climbers. During the year under report over 500 acres of *supari* gardens have been sprayed and the demonstration of spraying was made in 60 new villages. Meetings and training classes were held in 35 places and 53 sprayers and material worth about Rs. 2,000 were supplied. In Honawar, Kumta and Sirsi local merchants have begun to stock copper sulphate for the requirements of the cultivators. A sum of Rs. 750 was given in the form of bonus to the intelligent cultivators who helped the Department in extending the operation. Some of the co-operative societies in Siddapur and Honawar have purchased some sprayers for giving them on hire.

45. A power sprayer has been recently ordered from America and its trials are being taken in the current season. If this attempt succeeds the work of spraying will be greatly accelerated. In the Ratnagiri District the *supari* gardens of Dapoli and Chiplun Talukas were also sprayed with the help of 25 sprayers available in these tracts. The people are now convinced of the advantage of the spraying against koleroga disease.

46. (9) *Remedies against mango hoppers*.—As stated above, the dusting of sulphur against mango hoppers was found very efficient. Demonstrations of this method were given at Dapoli, Guhagar, Panchanadi, Ratnagiri, Rajapur, Devgad, Malvan and Vengurla on a very large scale and everywhere it was found successful. Twelve Peerless dust guns have been purchased by the cultivators to cope up with the work. In other districts similar demonstrations were made and most of the Taluka Development Associations have got their dusting machines. The only precaution necessary in this connection is the timely dusting of the trees before the attack of hoppers becomes severe.

47. (10) *Horticultural Classes*.—During the year under report, two horticultural classes were arranged with the help of the Horticultural Officer. The first was arranged at Ankola in the month of August which was attended by 36 students from Karwar, Kumta, Ankola and Honawar Talukas. This class was very much appreciated and the Karwar Taluka Development Association has now started a nursery for supplying grafts. The other class was organised at Jambul Agricultural School in February 1930 which was attended by 53 cultivators. Both the classes were quite successful and the demand for similar classes is received from other tracts.

48. Classes for canning mango-pulp, *jambul* juice, pine-apples, etc., were specially arranged at Ratnagiri and Rajapur in which the actual process of canning was done by the students. About 200 cans were

prepared in each centre. After the steam-canning of mango-pulp will be very profitable as a cottage industry.

49. (11) *Shows and demonstrations*.—During the year under report, a grand Agricultural and Cattle Show was organised under the auspices of the Dahanu Taluka Development Association at Bordi from 9th to 12th of March 1930. This show was practically arranged on the lines of the Presidency Agricultural Show. It had got separate sections for field produce, horticulture, flowers, agricultural research, manures, poultry, handicraft, dairy, machinery, forest produce, standing crops, cattle, etc. Several private nursery and seedsmen and a few Bombay firms have arranged their stalls in this exhibition. Special show guide dealing with all the sections was published in Marathi and Gujarati and its copies were distributed free. The opening ceremony was performed by Honourable Mr. G. B. Pradhan, the Finance Member of the Bombay Government, and more than ten thousand people had attended the Show on the first day. The President of the Show Committee was Mr. M. D. Bhat, I.C.S., Collector of Thana, who has taken keen interest in the organisation of the Show. At the time of opening he gave the detailed account of the origin and history of the Show. Mr. V. V. Gadgil dealt on the aims and objects of such shows. Rao Sahab Hargovan Walaji spoke on the importance of cattle and the work done by the Kandivali Gaurakshak Mandali. The Honourable Mr. Pradhan expressed his complete satisfaction for the excellent arrangement of the Show and referred to certain agricultural problems in the Thana District. At this Show actual demonstrations of the working of the improved implements, pumping plants, boring machine, water finder, tractor ploughing, vinegar-making, grafting, budding, manuring of garden crops and improved method of weaving, etc., were daily given and they are very much appreciated by the public. This Show was attended by more than 25,000 people from all parts of Thana and Bombay Suburban District. Thanks are due to the Bombay Gaurakshak Mandali for arranging the cattle section and offering gold and silver medals at the time of prize distribution. The District Co-operative Conference and the Tenth Anniversary of the Hakimji High School were also arranged at Bordi at the time of the Show. Magic lantern lectures and cinema films on various agricultural subjects and rural health were the special features of the Show. On the 12th of March, a prize distribution was made by the Deputy Director of Agriculture and in all 11 gold medals, 179 silver medals and 183 certificates were awarded.

50. One important feature of the Show was that it was arranged most economically and the total expenditure only came to Rs. 3,400. The success of the Show was mainly due to the untiring energy and work of Mr. K. M. Musale, Vice-President of the Association and Mr. S. L. Bhise, the General Secretary of the Show. A special mention should also be made of the services of Mr. K. B. Modi whose untiring efforts has contributed a good deal to the success of the Show. The Parsi and other intelligent cultivators of Bordi, Gholwad and Dahanu deserve special mention for sending exhibits and taking very active part in all the demonstrations and entertainment of the guests.

51. During the year under report, 214 demonstration plots were arranged in this Division. 160 small and big demonstrations and 21 magic lantern lectures were arranged.

52. (12) *Publications*.—During the year 93 articles on agricultural subjects were contributed to the Agricultural College magazine, Shetaki and Shetakari and the Kanarese Vakaltanu and Vakalganu. A bulletin on Sugarcane Cultivation in Kanara has been submitted and the Summary of the Mango Research Work at Ratnagiri is being drafted. The following leaflets were published during the year :—

- (1) Rabi Cultivation of Chillies in Konkan.
- (2) Economic Manures for Garden Crops in the North Thana.
- (3) Economy of Rice Seed and the proper method of raising Rice Seedlings in Kanara.
- (4) Improved Sugarcane Varieties for Kanara and Konkan in general.
- (5) Undi-cake as Manure.

Besides these the Taluka Development Associations have published several leaflets dealing with the importance of a particular subject in their tract.

III. Agricultural Organization

53. (1) *Divisional Board of Agriculture*.—During the year there were four quarterly meetings of the Konkan Divisional Board held in July, October, March and June. The first two meetings were presided by the Assistant Registrar, Co-operative Societies, Belgaum, and the remaining two by the Deputy Director of Agriculture, Konkan. Three new non-official members, viz. Mr. A. S. Phadke of Ratnagiri, Mr. K. T. Karulkar of Umbergaon and Mr. S. B. Patil of Palghar were nominated during the year.

54. (2) *Taluka Development Associations*.—There were in all 11 Taluka Development Associations at the beginning of the year and during the year under report, two new associations were organised at Mahad and Chiplun. But their registration is kept pending for want of subsidy. Out of these Taluka Development Associations, Sirsi, Rajapur, Palghar and Dahanu and the Mahad Association, newly organised, can be classed under A as they have done very good work. Malvan, Dapoli, Roha, Umbergaon and Karwar can be classed under B; while very little progress was observed in Kalyan and Ratnagiri Associations. Useful work done by some of the associations is recorded below :—

(1) The Sirsi Association has rendered very valuable service in spraying against koleroga disease to the extent of 200 acres.

(2) The Rajapur Association had arranged several demonstration plots and the distribution of seeds and manures to a considerable extent. It has helped the Shikshan Prasarak Mandal in starting the new agricultural school.

(3) The Palghar Association had taken a lead in the distribution of seeds and manures and had arranged 50 demonstration plots. It had published four leaflets on different subjects which were of great

importance to the cultivators of that taluka. Its financial condition is also fairly well.

(4) The Dahanu Association had rendered unique service in organising the District Agricultural and Cattle Show at Bordi which was a grand success.

(5) The newly started association of Mahad had collected Rs. 3,000 and had arranged 16 demonstration plots. The introductions of tobacco, sugarcane, onions and the new strains of rice and *nagli* are some of the important works undertaken by this association.

Most of these associations have now maintained trained kangars for propaganda work and the number of their members varies from 500 to 1,500.

55. (3) *Co-ordination with Revenue and Agricultural Departments.*—During the year two District Meetings of the officers of Revenue and Agricultural Departments and the members of the District Local Boards were held at Ratnagiri in July 1929 and at Alibag in November 1929 under the Chairmanship of the Collectors of those Districts. The activities of the Agricultural Department in each district were explained in these meetings by the Deputy Director of Agriculture and new lines of works were chalked out with the help of the members present.

56. Fourteen big taluka meetings were arranged by the District Staff in co-operation with the Revenue Officers while 40 village meetings were arranged during the year. The Deputy Director of Agriculture had called upon the Collectors of the four Districts while on tour and they were given full information about the agricultural activities conducted in their tracts.

IV. Agricultural Service

57. *Boring work.*—During the year under report, the acting Boring Assistant, Mr. N. B. Limaye, was transferred to Nasik and Mr. G. S. Joshi has now been permanently appointed to this post. Mr. Joshi was under training for five months from December to April and during that period Mr. S. D. Muzumdar, a Non-graduate Assistant of the Ratnagiri Farm, was in charge of the boring work. There were seven power boring machines including the Calyx in this Division but the demand for boring was so great that it was impossible to complete the works of the present applicants within a couple of years. Two hand machines were kindly lent by the Agricultural Engineer in December 1929 and a further correspondence is going on to spare four more machines for Konkan Division.

58. The total number of bores undertaken was 84 as against 50 of the previous year. Out of these 84 bores 54 were successful, 10 unsuccessful, 8 abandoned at the request of the owners and 6 were discontinued due to technical difficulties. The work of 6 bores is still in progress. The total footage of bores was 5,860 feet 9 inches as against 4,482 feet 5 inches of the previous year. The increased output due to careful supervision and constant check of the Deputy Director on the Boring Mukadams. The Agricultural Engineer also rendered valuable help in

supervising the machines and arranging the necessary repairs. At Borivali a bore was tapped to a depth of 300 feet with the Calyx machine still the water was insufficient. The statement of detailed information regarding the boring work prescribed in Government Resolution No. 7075, Revenue Department, dated 5th May 1923 is appended herewith.

V. Agricultural Education

59. *Jambul Agricultural School*.—During the year there were 7 students in the second year, all of whom have passed creditably in the last annual examination. In the first year 24 students were admitted in the beginning but 11 of them had to leave the school on account of ill-health and bad climate. The number of students remained throughout the year in the first year was 13 out of which 11 passed and were promoted to second year. During the month of June 1930, 21 new students have joined the school. The annual examination of the students was taken by the Inspector of Agricultural School and Mr. M. V. Gadgaki, Rice Specialist, Karjat, and their remarks are given below.

The boys seem to have done better in practical agriculture than in previous year. There should be full stock of all the required implements for training the boys. It is generally noted that the vernacular teachers neglect their subjects. The Head Master should exercise proper supervision and check over the vernacular teachers classes. It seems advisable that the annual results should be taken into account while giving their increments and promotions.

60. It is gratifying to note that the Shikshan Prasarak Mandal of Rajapur has started another Agricultural School at Rajapur to serve the requirements of the agricultural education of the Ratnagiri District. They have taken the services of Mr. R. D. Khandekar who has got full experience in conducting the agricultural school. The school was started with 14 boys in the last November and is now fully equipped with the school farm, workshop poultry and other accessories required for the agricultural school. The progress of this school will be watched with keen interest as this is the first institution solely conducted by private bodies in the Bombay Presidency.

Personal

61. The whole staff including my office have put in satisfactory work during the year even they had to pass through the financial stringency.

V. V. GADGIL,
Deputy Director of Agriculture,
Konkan Division.

Ratnagiri, 21st July 1930.

Annual Report of Boring Work done during the year 1929-30

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the bore
<i>Machine No. 2 (Calyx Drill)</i>					
1	Mr. D. R. Joshi	..	Sabette	Vile Parle	Surface
2	Do.	..	Do.	Do.	Do.
3	Mr. Kantawala Nanavati	..	Do.	Do.	Do.
4	„ H. P. Shroff	..	Do.	Do.	Do.
<i>Machine No. 15 (Musto Power)</i>					
5	Mr. Kisanlal Ghanashyam	..	Sabette	Malad	Well
6	Do.	..	Do.	Do.	Surface
7	Mr. M. M. Khundake	..	Do.	Do.	Do.
8	Do.	..	Do.	Do.	Do.
9	Mr. Ranchoddas Narayandas	..	Do.	Do.	Well
10	President, Thana Municipality	..	Thana	Thana	Do.
11	Do.	..	Do.	Do.	Surface
12	Do.	..	Do.	Do.	Well
<i>Machine No. 46 (Musto Power)</i>					
13	Mr. S. R. Save	137	Palghar	Kelva	Well
14	„ R. R. Raut	111	Do.	Do.	Do.
15	Do.	111	Do.	Do.	Do.
16	Mr. N. G. Raut	133	Do.	Do.	Do.
17	„ G. L. Joshi	184	Do.	Do.	Do.
18	Do.	44	Do.	Do.	Do.
19	Do.	43	Do.	Do.	Do.
20	Mr. K. J. Raut	119	Do.	Do.	Do.
21	Do.	65	Do.	Do.	Do.
22	Mr. R. J. Patil	73	Do.	Do.	Do.
23	Do.	130	Do.	Do.	Do.
24	Village Panchayat	..	Do.	Palghar	Surface
25	Mr. Devji Mohamad	..	Do.	Do.	Do.
<i>Machine No. 16 (Musto Power)</i>					
26	Mr. G. L. More	..	Dahanu	Berigaon	Well
27	„ H. G. Tanna	..	Do.	Saravali	Do.

ending 30th June 1930 in the Konkan Di

Diameter of the bore	Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charges
					Rs. a. p.
5"	120'	NH.	NH.	NH.	112 8 0
6"	300'	NH.	40	40	333 2 0
5"	50'	NH.	250	250	31 0 0
5"	161'-6"	....	....	....	....
4"	171'	NH.	250	250	137 8 0
4"	201'	....	....	....	175 0 0
4"	118'-6"	....	....	....	151 0 0
4"	117'	....	250	250	117 0 0
4"	201'	....	....	....	398 8 0
4"	60'	....	480	480	39 0 0
4"	70'	....	200	200	65 4 0
4"	115'	....	....	....	....
4"	62'	....	....	1,500	18 0 0
4"	35'	....	....	250	6 0 0
4"	70'	....	....	....	20 0 0
4"	46'	....	....	250	15 0 0
4"	57'	....	....	250	18 8 0
4"	61'	....	....	....	20 0 0
4"	58'	....	....	300	32 8 0
4"	46'	....	....	300	24 4 0
4"	36'	....	....	250	18 7 0
4"	27'	....	....	....	27 8 0
4"	56'	....	....	....	25 0 0
4" & 3"	80'	....	....	250	18 8 6
4"	61'	....	....	....	....
4"	107'	....	....	....	50 0 0
4"	50'	....	....	400	21 8 0

Annual Report of Boring Work done during the year 1929-30

Serial No.	Name of well owner	Cost of fuel, Lubricating oil, coal, carting, casing, cutting shoe, etc.	Departmental charges for the well owner	Average Departmental expenses on the bore including	
				Supervision and depression charges	Running expenses, mechanics wages and repair
		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
<i>Machine No. 2 (Calyx Drill)</i>					
1	Mr. D. R. Joshi	95 6 0	15 12 0	7 0 0	60 0 0
2	Do.	240 0 0	70 0 0	24 0 0	220 0 0
3	Mr. Kantawala Nanavati	77 10 0	59 3 6	4 0 0	32 0 0
4	„ H. P. Shroff .. ..	....	....	....	....
<i>Machine No. 15 (Musto Power)</i>					
5	Mr. Kisanlal Ghanashyam	82 0 0	262 4 0	17 8 0	147 0 0
6	Do.	46 8 0	29 12 0	14 7 0	121 0 0
7	Mr. M. M. Khandake	83 1 9	177 6 0	14 7 0	121 0 0
8	Do.	34 13 0	154 10 0	13 2 0	110 0 0
9	Mr. Ranchoddas Narayandas	217 9 0	....	35 7 0	307 0 0
10	President Thana Municipality	65 10 0	65 0 0	3 8 0	30 0 0
11	Do.	51 11 0	30 0 0	4 13 0	40 8 0
12	Do. .. ..	....	....	....	....
<i>Machine No. 16 (Musto Power)</i>					
13	Mr. S. R. Save	63 14 0	90 12 0	4 0 0	34 15 0
14	„ B. E. Raut	6 15 0	42 2 0	1 3 0	10 8 0
15	Do.	13 6 0	30 6 0	3 8 0	26 0 0
16	Mr. N. G. Raut	25 0 0	58 5 0	2 10 0	21 0 0
17	„ G. L. Joshi	22 8 0	74 14 0	3 8 0	26 0 0
18	Do.	27 0 0	35 2 0	2 8 0	23 0 0
19	Do.	37 0 0	57 8 0	5 11 0	45 8 0
20	Mr. K. J. Raut	35 6 6	54 15 0	4 13 0	33 3 0
21	Do.	100 12 0	38 2 0	3 1 0	26 0 0
22	Mr. R. J. Patil	104 14 0	28 14 0	4 13 0	37 3 0
23	Do.	79 4 0	60 14 0	4 6 0	35 0 0
24	Village Panchayat	56 5 0	133 0 6	3 1 0	26 0 0
25	Mr. Devji Mohamad .. ..	....	....	....	....
<i>Machine No. 16 (Musto Power)</i>					
26	Mr. G. L. More	70 12 0	135 8 0	10 15 0	100 0 0
27	„ H. G. Tanna	140 4 0	51 8 0	5 11 0	53 0 0

ending 30th June 1930 in the Konkan Division—contd.

Cost of Bore to the well owner	Total cost of the bore inclusive of well-owner's and Departmental cost	Cost per foot for the well owner	Total cost per foot	Object of boring, i.e., agriculture or drinking	Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
228 10 0	290 10 0	1 13 0	2 7 6	Drinking ..	Bore abandoned on account of saltish water tapped.
693 2 0	937 2 0	2 5 0	3 2 0	Do. ..	Unsuccessful.
217 13 6	253 13 6	4 5 9	5 1 3	Do. ..	Successful.
....	....	....	....	Do. ..	In progress.
491 12 0	646 4 0	2 13 0	3 12 5	Do. ..	Successful.
251 4 6	356 11 0	1 4 0	1 11 0	Do. ..	Unsuccessful.
411 7 9	546 14 9	3 7 6	4 9 0	Do. ..	Do.
306 7 0	429 9 0	2 9 11	3 10 6	Do. ..	Successful.
....					
169 10 0	203 2 0	2 9 6	3 6 2	Drinking ..	Successful.
196 15 0	242 4 0	2 13 3	3 7 4	Do. ..	Do.
....	....	....	....	Do. ..	In progress.
177 10 0	216 9 0	2 13 0	3 7 0	Agriculture	Successful.
55 1 0	66 14 0	1 9 2	1 18 6	Do. ..	Do.
118 12 0	148 4 0	1 11 2	2 1 10	Do. ..	Abandoned at owner's request.
96 5 0	121 15 0	2 2 2	2 10 6	Do. ..	Successful.
115 14 0	144 12 0	2 0 6	2 8 7	Do. ..	Do.
132 2 0	181 10 0	2 2 8	2 10 4	Do. ..	Do.
177 0 0	228 3 0	3 5 5	4 4 9	Do. ..	Do.
114 9 6	157 9 6	2 8 0	3 6 1	Do. ..	Do.
157 5 0	186 6 0	4 6 0	3 3 8	Do. ..	Do.
161 4 0	203 4 0	5 15 0	7 8 5	Do. ..	Abandoned at owner's request.
165 2 0	204 8 0	2 15 2	3 10 10	Do. ..	Do.
332 14 0	361 15 0	4 2 7	4 8 9	Do. ..	Successful.
....	....	....	....	Do. ..	In progress
256 4 0	367 3 0	2 6 3	3 6 10	Agriculture	Not yet tested.
214 4 0	271 15 0	4 4 3	5 7 0	Do. ..	Successful.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore
28	Mr. H. G. Thana ..	..	Dahanu	Saravali	Well
29	Do. ..	..	Do.	Do.	Do.
30	Do. ..	..	Do.	Do.	Surface
31	Mr. R. J. Karandikar ..	..	Do.	Malyan	Well
32	Do. ..	..	Do.	Do.	Do.
33	Do. ..	..	Do.	Do.	Do.
34	Do. ..	..	Do.	Do.	Do.
35	Mrs. Jannabai Madhvaji ..	..	Do.	Gholwad	Do.
36	Agricultural Show ..	..	Do.	Bordi	Surface
37	Mrs. Jannabai Madhvaji ..	..	Do.	Gholwad	Well
38	Do. ..	..	Do.	Do.	Do.
39	Do. ..	..	Do.	Do.	Do.
40	Mr. S. A. Kalyanwala ..	..	Do.	Do.	Do.
41	„ D. N. Sidhava ..	..	Do.	Do.	Do.
<i>Machine No. 14 (Hand Machine)</i>					
42	Mr. K. N. Irani ..	111	Palghar	Boisar	Surface
43	Do. ..	42	Do.	Do.	Do.
44	Do. ..	42	Do.	Do.	Do.
45	Do. ..	52	Do.	Do.	Well
46	Mr. B. J. Mistri ..	52	Do.	Do.	Do.
47	Do. ..	52	Do.	Do.	Do.
48	Do. ..	124	Do.	Do.	Do.
49	Mr. K. N. Marzaban ..	11	Do.	Do.	Do.
50	Do. ..	124	Do.	Do.	Do.
51	Mr. J. K. Irani ..	112	Do.	Do.	Do.
52	„ K. M. Irani ..	112	Do.	Do.	Do.
<i>Machine No. 5 (Hand Machine)</i>					
53	Mr. A. G. Sathye ..	33	Thana	Thana	Well
54	Do. ..	33	Do.	Do.	Surface
55	Mr. A. S. Divadkar ..	..	Do.	Ghansoli	Well
56	Do. ..	..	Do.	Do.	Surface
57	Do. ..	..	Do.	Do.	Do.
58	Tribhuvandas Jannadas ..	..	Do.	Thana	Do.

Diameter of the bore	Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charges
					Rs. a. p.
4"	42'	....	....	250	18 0 0
4"	64'	....	....	250	25 8 0
4"	101'	....	....	250	26 8 0
4"	75'	....	....	250	14 0 0
4"	99'	....	....	250	19 8 0
4"	45'	....	....	....	30 8 0
4"	56'	....	....	600	13 8 0
4"	50'	....	....	200	16 0 0
4"	57'	....	....	....	....
4"	124'	....	....	....	30 0 0
4"	76'	....	....	250	16 0 0
4"	72'	....	....	250	46 0 0
4"	32'	....	....	250	6 0 0
4"	105'	....	....	....	....
3"	42'	....	....	250	35 0 0
3"	10'	....	....	....	....
3"	44'	....	....	300	60 0 0
3"	49'	....	....	1,800	78 2 0
3"	40'	....	....	1,800	50 10 0
3"	44'	....	....	1,800	49 9 0
3"	72'	....	....	200	108 8 0
3"	59'	....	....	200	70 8 0
3"	32'	....	....	....	....
3"	37'	....	....	900	58 8 0
3"	20'	....	....	1,200	54 0 0
3"	52'	....	....	250	217 14 0
3"	98'	....	....	250	254 10 0
3"	95'	....	....	....	....
3"	50'	....	....	220	58 8 0
3"	99'	....	....	....	130 8 0
3"	40'	....	....	....	....

Serial No.	Name of well owner	Cost of fuel, Lubricating oil, coal, carting, casing, cutting shoe, etc.	Departmental charges for the well owner	Average Departmental expenses on the bore including	
				Supervision and depression charges	Running expenses, mechanics, wages and repair
		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
28	Mr. H. G. Tanna ..	44 12 0	44 4 0	4 13 0	44 0 0
29	Do. ..	47 9 9	74 12 0	7 7 0	68 0 0
30	Do. ..	41 11 6	126 8 0	7 0 0	64 0 0
31	Mr. R. J. Karandikar ..	48 8 6	87 8 0	3 15 0	36 0 0
32	Do. ..	45 9 6	128 8 0	5 11 0	52 0 0
33	Do. ..	60 15 0	45 0 0	7 7 0	68 0 0
34	Do. ..	51 14 0	59 0 0	3 1 0	21 0 0
35	Mrs. Jannabai Madhavji ..	75 15 0	50 0 0	3 15 0	24 0 0
36	Agricultural Show ..	.....	.....	.....	.....
37	Mrs. Jannabai Madhavaji ..	59 4 0	168 11 0	6 2 0	37 8 0
38	Do. ..	26 15 0	89 0 0	4 6 0	27 0 0
39	Do. ..	61 0 0	104 4 0	7 9 0	30 10 8
40	Mr. S. A. Kalyanwala ..	22 3 0	23 6 0	0 11 0	2 10 2
41	Mr. D. N. Sidhava ..	.....	.....	.....	.....
	<i>Machine No. 15 (Hand Machine)</i>				
42	Mr. K. N. Irani ..	28 7 0	42 0 0	3 1 0	12 0 0
43	Do. ..	.....	.....	.....	.....
44	Do. ..	31 6 0	44 0 0	4 4 3	20 5 0
45	Do. ..	8 4 0	49 0 0	4 0 0	10 4 0
46	Mr. B. J. Mistri ..	11 0 0	46 0 0	3 4 3	16 0 0
47	Do. ..	15 11 0	44 0 0	2 10 0	12 0 0
48	Do. ..	10 6 0	83 0 0	7 9 0	36 12 10
49	Mr. K. N. Marzaban ..	14 0 0	63 0 0	5 4 0	21 5 4
50	Do. ..	.....	.....	.....	.....
51	Mr. J. K. Irani ..	5 13 0	37 0 0	3 15 0	20 13 10
52	„ K. M. Irani ..	1 12 0	20 0 0	3 4 6	20 10 3
	<i>Machine No. 5 (Hand Machine)</i>				
53	Mr. A. G. Satbye ..	5 0 0	53 0 0	7 14 0	48 5 4
54	Do. ..	6 12 0	122 0 0	10 0 0	54 0 0
55	Mr. A. S. Divadhar ..	.....	.....	.....	.....
56	Do. ..	28 7 0	50 0 0	3 4 6	18 0 0
57	Do. ..	8 8 0	.....	13 7 0	73 12 8
58	Trimbhuvandas Jannadas ..	.....	.....	.....	.....

Cost of Bore to the well owner	Total cost of the bore inclusive of well-owner's and Departmental cost	Cost per foot for the well owner	Total cost per foot	Object of boring, i.e., agriculture or drinking	Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
107 0 0	155 13 0	2 8 2	3 11 6	Agriculture	Successful.
150 13 9	226 4 9	2 5 11	3 8 8	Do.	Do.
194 11 6	265 11 6	1 14 10	2 10 1	Do.	Do.
144 11 6	184 10 6	1 14 10	2 7 5	Do.	Do.
188 6 6	246 1 6	1 14 5	2 7 9	Do.	Do.
154 7 0	229 14 0	3 6 10	5 3 6	Do.	Abandoned at owner's request.
124 6 0	148 7 0	2 3 6	2 10 9	Do.	Successful.
141 15 0	169 14 0	2 13 3	3 6 4	Do.	Do.
....	19 7 0	....	....	Do.	
247 15 0	291 9 0	2 0 0	2 5 6	Do.	Unsuccessful.
181 15 0	168 5 0	1 11 9	2 2 4	Do.	Successful.
200 11 4	249 7 8	2 15 0	3 7 7	Do.	Do.
51 9 0	54 14 8	2 5 6	2 8 0	Do.	Do.
....	....	....	....	Do.	Details not received from owner.
105 7 0	120 8 0	2 8 2	2 13 11	Do.	Successful.
	Abandoned due to technical difficulties.				
135 6 0	159 15 3	3 1 3	3 10 2	Agriculture	Do.
130 6 0	153 10 0	2 10 4	3 2 2	Do.	Do.
107 10 0	126 14 6	2 5 6	2 13 2	Do.	Do.
105 4 0	119 14 0	2 6 3	2 11 7	Do.	Do.
196 14 0	241 3 10	2 12 4	3 5 7	Do.	Do.
153 8 0	180 1 4	2 9 6	3 0 9	Do.	Do.
....	....	....	....	....	Incomplete due to accident.
101 5 0	125 0 10	2 11 6	3 6 3	Agriculture	Successful.
76 12 0	99 11 2	3 12 7	4 15 9	Do.	Do.
275 14 0	327 1 4	5 5 0	6 4 7	Drinking	Successful.
261 6 0	325 6 0	2 10 3	3 5 1	Do.	Do.
....	....	....	....	Agriculture	Unsuccessful. Details not received.
136 15 0	153 3 6	2 11 0	3 2 7	Do.	Successful.
138 8 0	225 11 8	1 6 6	2 5 5	Do.	Unsuccessful.
....	....	....	....	Do.	In progress.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore
KOLABA DISTRICT					
<i>Machine No. 6 (Musto Power)</i>					
59	Mr. D. S. Haldavankar	..	Allhag	Bandhan	..
60	Do.	..	Do.	Do.	..
61	Mr. Y. P. Kinare	..	Do.	Do.	..
62	Do.	..	Do.	Do.	..
63	Mr. V. Y. Tondulkar	..	Do.	Do.	..
64	„ Gulabchand Nathalal	..	Pen	Antora	Surface
65	„ S. G. Mokashi	Gaothan	Do.	Pen	Do.
66	„ S. V. Kulkarni	Do.	Do.	Do.	Do.
67	„ B. M. Tilak	1	Do.	Wawoshi	Well
68	Do.	1	Do.	Do.	Surface
69	Do.	1	Do.	Do.	Do.
70	Mr. B. B. Tilak	Gaothan	Do.	Do.	Do.
71	„ V. L. Tilak	Do.	Do.	Do.	Do.
<i>Machine No. 20 (Musto Power)</i>					
72	Mr. Harjivan Hirjeshet	..	Mahad	Mahad.	Surface
73	The Executive Engineer	..	Do.	Do.	Do.
74	Mr. Pittambar Bhikoo Gandhi	..	Do.	Do.	Do.
75	„ M. L. Gujar	..	Do.	Do.	Well
76	„ Mehta Narayan Butala	..	Do.	Do.	Surface
77	„ G. K. Kudalkar	..	Do.	Do.	Do.
78	„ Dagdu Govind Mehta	..	Do.	Do.	Do.
79	„ S. P. Joshi	..	Do.	Do.	Do.
80	„ Ibrahimsalheb Mahomed salo Alekar.	..	Do.	Rajewadi	Do.
KANARA DISTRICT					
<i>Machine No. 21 (Musto Power)</i>					
81	The Executive Engineer	..	Karwar	Karwar	Surface
82	Do.	..	Do.	Do.	Do.
83	Do.	..	Do.	Do.	Do.
<i>Tripod Work.</i>					
84	Mr. S. B. Naik	..	Paighar	Paighar	Do.

Diameter of the bore	Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charges
					Rs. a. p.
4"	60'	....	....	250	....
4"	39'	....	....	250	44 0 0
4"	18'	....	....	....	....
4"	68'	....	....	250	35 0 0
4"	35'	....	....	250	25 4 0
4"	62'	....	....	250	36 0 0
4"	102'	....	....	....	61 0 0
4"	76'	....	....	300	44 0 0
4"	50'	....	....	00	....
4"	48'	....	....	200	9 0 0
4"	60'	....	....	300	21 0 0
4"	64'	....	....	230	26 0 0
4"	68'	....	....	....	....
4"	65'	....	....	250	....
4"	150'	....	....	250	96 12 0
4"	30'	....	....	80	41 12 0
4"	30'	....	....	250	43 3 0
4"	30'	....	....	250	42 0 0
4"	30'	....	....	400	56 8 0
4"	95'	....	....	300	41 0 0
4"	22'-6"	....	....	....	....
4"	72'	....	....	300	58 12 0
4"	61'	....	....	12	....
4"	17'-9"	....	....	....	....
4"	47'	....	....	....	....
4"	40'	....	....	250	....

Serial No.	Name of well owner	Cost of fuel, Lubricating oil, coal, carting, casing, cutting shoe, etc.	Departmental charges for the well owner	Average Departmental expenses on the bore including	
				Supervision and depression charges	Banning expenses, mechanics wages and repair
	KOLABA DISTRICT	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
	<i>Machine No. 6 (Musto Power)</i>				
59	Mr. D. S. Haldavankar ..	....	65 0 0	....	....
60	Do. ..	53 12 0	100 0 0	8 12 0	74 0 0
61	Mr. Y. P. Kinare ..	....	....	....	....
62	Do. ..	28 4 0	78 0 0	8 2 0	55 0 0
	Mr. Y. Y. Tendulkar ..	50 9 0	58 6 0	6 2 0	55 0 0
	„ Gulabchand Nathalal ..	88 14 6	68 0 0	6 2 0	55 0 0
65	„ S. G. Mokashi ..	88 4 0	128 0 0	8 14 0	90 0 0
66	„ S. V. Kulkarni ..	52 8 0	80 0 0	4 0 0	52 0 0
67	„ B. M. Tilak ..	....	....	....	....
68	Do. ..	16 0 0	48 10 0	1 15 0	22 0 0
69	Do. ..	38 8 0	66 12 0	4 0 0	51 5 0
70	Mr. R. R. Tilak ..	50 12 0	71 10 0	4 4 3	49 13 4
71	„ V. L. Tilak ..	....	....	....	....
	<i>Machine No. 20 (Musto Power)</i>				
72	Mr. Harjivan Hirjeshet ..	....	78 4 0	....	....
73	The Executive Engineer ..	120 10 1	250 11 0	15 4 0	140 0 0
74	Mr. Pitambar Bhikoo Gandhi ..	46 11 0	95 0 0	7 14 0	60 0 0
75	„ M. L. Gujar ..	37 6 0	95 12 3	8 5 0	68 5 3
76	„ Mohita Narayan Butala ..	46 4 0	95 4 8	9 3 0	70 0 0
77	„ G. K. Kudalkar ..	58 0 0	95 0 0	9 3 0	98 6 0
78	„ Dagdu Govind Mehta ..	63 0 0	117 8 0	6 9 0	64 11 0
79	„ S. P. Joshi ..	....	....	....	....
80	„ Ibrahimsaheb Mahomed sale Alekar.	66 10 0	88 0 0	7 3 0	77 0 0
	KANARA DISTRICT				
	<i>Machine No. 21 (Musto Power)</i>				
81	The Executive Engineer ..	....	....	....	....
82	Do. ..	....	....	....	....
83	Do. ..	....	....	....	....
	<i>Tripod Work</i>				
84	Mr. S. B. Nalk ..	....	13 5 4	....	....

Cost of Bore to the well owner	Total cost of the bore inclusive of well owner's and Departmental cost	Cost per foot for the well owner	Total cost per foot	Object of boring, i.e., agriculture or drinking	Remarks
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
....	....	....	....	Drinking ..	Details not received. Successful.
206 12 0	289 8 0	2 5 1	3 5 0	Do.	Successful.
	Abandoned owing to technical difficulties.				
136 4 0	197 6 0	2 0 0	2 2 8	Drinking ..	Successful.
143 3 0	204 5 0	2 9 7	3 11 4	Do.	Do.
192 14 8	254 0 6	2 18 4	4 1 7	Do.	Do.
272 4 0	390 2 0	2 10 6	3 13 3	Do.	Abandoned at the owner's request.
185 8 0	242 1 6	2 14 0	3 0 10	Do.	Successful.
....	....	....	....	Agriculture.	Details not received. Unsuccessful.
76 10 0	97 9 6	1 8 6	2 0 7	Do.	Successful.
124 15 0	180 13 10	2 1 4	3 3 6	Do.	Do.
157 6 0	211 7 7	2 6 3	3 4 9	Do.	Do.
....	....	....	....	Do.	In progress.
....	....	....	....	Drinking ..	Successful. Details not received.
468 1 1	623 5 1	3 1 11	4 2 5	Do.	Successful.
183 7 0	261 5 0	2 4 3	3 4 3	Do.	Do.
176 10 0	248 4 3	2 3 4	3 1 7	Do.	Do.
183 3 3	262 11 3	2 4 8	3 4 3	Do.	Abandoned at the owner's request.
209 8 0	312 1 0	2 9 9	3 2 0	Do.	Successful.
221 8 0	292 12 0	2 5 3	3 1 4	Do.	Do.
....	....	....	....	Do.	Incomplete due to accident.
208 6 0	292 9 6	2 14 3	4 1 0	Do.	Successful.
....	....	....	....	Do.	Unsuccessful. Details not received.
	Abandoned owing to technical difficulties.				
....	....	....	....	Drinking ..	In progress.
....	....	....	....	Do.	Successful. Details not received from the owner.

V. V. GADGIL,

Deputy Director of Agriculture, Konkan Division, Ratnagiri.

APPENDIX H

SUMMARY OF THE WORK DONE UNDER THE DEPUTY DIRECTOR
OF AGRICULTURE, SIND, DURING THE YEAR 1929-30*Organization and Finance*

There is nothing of special importance to mention under organization as both the superior and the subordinate staff continued to be the same as in the previous year.

The total expenditure of the division amounted to Rs. 2,34,200 as against Rs. 1,65,778 of the previous year.

The cash receipts during the year amounted to Rs. 31,249 as against Rs. 59,467 of the previous year.

Season

2. The main seasonal factor in the agricultural season of the Sind Province is the inundation of the river Indus. The river behaved most unusually in the season under review. It started with abnormally low levels and this state of affairs continued well into the early part of the season. In the middle of the season, however, the river rose so high as to record the most unusual height of 63' of water at Attock and 17' 3" at Bukkur. This caused serious floods in parts of Sukkur, Larkana, Nawabshah and Karachi. Fortunately these high levels were maintained for only a short time and thereafter the fall was so rapid that many of the inundation canals stopped flowing a couple of weeks earlier than their usual time. The high level canals notably the Jamrao canal, however, continued to work very well in the rabi season and gave water supply sufficient to mature the rabi crops.

3. *Rainfall.*—This is normally very small in Sind but the rainfall of the season under report was unparalleled in living memory. East Sind recorded as much as 50 inches while the rest of Sind received amounts varying from 10 to 30 inches. The cumulative effect of the extraordinary behaviour of the river and the heavy rainfall has been that:—

(1) Some areas on the inundation canals which had been intended for cotton could not be sown timely on account of the late inundation and were therefore put under bajri.

(2) The cultivation of some of the fine varieties of rice with long growing periods in North Sind had to be abandoned for want of timely supply of water and substituted by the coarse varieties with short growing periods.

(3) A large number of Farm buildings in the country side were destroyed and also the live stock and the crops on the low lying areas suffered considerably.

The above dark cloud had, however, a silver lining and perhaps at no time was the truth of the Sindhi proverb "it is better to be drowned than

to be dried" proved than in the year under review. The people took advantage of the moisture left in the soil by heavy floods and rain and record areas were put under Rabi crops which all came to maturity without mishap.

4. *Crop pest and diseases*.—The most serious pest was the locust. Grass hoppers and boll-worm were also active and the field rat was exceptionally destructive in damaging the wheat crop in Hyderabad and Thar Parkar districts.

5. *Agricultural labour*.—This was on the whole sufficient although wages ruled high.

6. *Conclusion*.—Taking all things together the agricultural year was one of the worst on record. Depression in trade aggravated the situation further by bringing down prices of agricultural products to figures not known during the last two decades. Relief was, however, afforded by liberal grants of Taccavi loans and the full or partial remission of assessment by Government in deserving cases and by the charity of private subscribers.

Research and Investigation

7. This work may be divided into two parts:—

(a) Prospective work with special reference to perennial irrigation which will be available on the completion of the Barrage works.

(b) Work on crops and implements for the present needs of the country.

Work under (a) is being done at the Research Station, Sakrand, District Nawabshah, and that under (b) is in charge of the Deputy Director of Agriculture, Sind, and forms the subject-matter of this report.

8. The crops dealt with were the following:—

- (1) Rice,
- (2) Jowar,
- (3) Wheat,
- (4) Cotton.

9. *Rice Improvement*.—Work on rice is conducted on the Larkana Farm. An area of 31 acres and 31 gunthas was sown with selected strains as under:—

Variety	Area	
	A.	g.
Jajai	2	35
Prong	3	35
Kangani	18	9

In addition to the above, 1 acre 20 gunthas were allotted for raising seeds of the three strains, for the next year's sowing on the Farm, 2 acres 15 gunthas were utilized by the rice breeding section for conducting various trials, 1 acre 12 gunthas were occupied by rice seedlings, 1 acre 5 gunthas were sown with the Bengalo variety of rice and the remaining 20 gunthas were utilized for carrying out investigation on the Rati disease.

The seedlings were as usual raised by pumping water from the Ghar canal and transplantation started on the arrival of water in the Abro canal feeding the Farm area, in June.

As the transplantation was going on, a heavy shower of rain, abnormal for the country, came on in July which did not only submerge the crop but the entire Farm area and as there were no immediate means of draining off the flood water, the crop suffered to some extent. The area which was still to be sown set so hard as to necessitate the reploughing of the land to make the soil sufficiently soft for transplanting seedlings. In August following, the river rose abnormally high and as there was a danger of floods all over the country, the Abro canal was closed down as a safeguard against floods at the tail of that canal. The farm which is on the upper reach of the canal did not therefore get water for some considerable time and although some temporary arrangement was made to bring water by pumping it from the Ghar canal two miles away, yet the quantity fell short of the actual requirement of the crop. All the above factors affected the crops adversely and consequently the yields came to about one-half of the previous year as the following figures of the multiplication area will show :—

Variety	Area		Total yield in	Yield per acre in
	A.	g.	lbs.	lbs.
Jajai	2	35	3,890	4,353
Prong	3	35	4,960	1,280
Kangani	18	9	13,507	741

The entire quantity of the above produce has been given out in the current year (1930) to seed growers for further multiplication.

Bengalo.—A locally acclimatized variety of Bengal was again tried on a field scale (1 acre 5 gunthas) in comparison with similar scented varieties of Larkana. It has not, however, shown any superiority in yield, so far, over either Jajai or Prong.

The yields per acre were as under :—

	lbs.
Jajai	1,320
Prong	1,280
Bengalo	1,274

10. Regarding investigation of Rati diseases, the previous year's seed from Rati infested crop was sown both on the Farm and at Kambar after the seed was treated with various chemicals by the Plant Pathologist. Unfortunately the plot at Kambar was submerged as the result of heavy rains while the plot on the farm showed very little sign of the fungus attack. This work is, however, being repeated in the current year (1930).

In the trial of Dubari crops after paddy and then growing paddy on the same land next season, Berseem has again proved its superiority over the two common "Dubari" crops of Larkana, viz., Gram and Matar.

The following are the figures of yield of paddy after each dubari crop :—

Series				Area	Crop	Average per acre
				A. g.		lbs.
F	..	..	..	2 11	Berseem	1,056
G	..	..	..	3 13	Gram	421
H	..	..	..	2 35	Matar	548

11. *Jowar Improvement.*—The area under Jowar on the Larkana Farm was 7 acres and was sown for the multiplication of seed with the following varieties selected out of a large collection, for their high yielding capacity :—

Variety	Area	Outturn per acre
	A. g.	lbs.
Baghdar ..	.. 2 0	282
Saoro Kartuhio ..	.. 1 0	170
Allakh ..	.. 2 0	1070
Red Janpur ..	.. 2 0	600

The seed of the bagged heads was sown after steeping the same in copper sulphate solution as a preventive against grain smut. The crop was damaged by heavy showers which caused stagnation of water ; consequently it became patchy and gave a comparatively poor outturn. The seeds of these have been made available for distribution in 1930.

12. *Wheat Improvement.*—Work on this crop has been in progress for some years and may be classified into the following two groups :—

(i) Introduction of varieties of high reputation from other parts of India.

(ii) Improvement of local Sind varieties.

The examples of (i) are Pusa 12 and Punjab 11, wheats with a fresh addition of 8-A and that of (ii) are the strains A.T. 38 and Cph 47 selected from the ordinary local Thori and Phundani wheats.

In North Sind which has by far the largest area under wheat cultivation annually, Pusa 12, strains A.T. 38 and Cph 47 have proved satisfactory whereas Punjab wheats appear to be better suited for the rest of the Province.

The detailed work carried out on this crop on our Farms at Larkana, Jacobabad and Mirpurkhas during the year under report was as under :—

13. *Larkana Farm*.—Four acres and fifteen gunthas were sown under irrigation of which 3 acres and 35 gunthas were for the multiplication of Cph 47 (Phundani) and the remaining half an acre was devoted to the comparison of the two Punjab varieties, viz., Punjab 11 and Punjab 8-A with Phundani strain 47.

The yield figures of the multiplication area were as under :—

Plot No.	Area	Variety	Yield in lbs.	
			Grain	Straw
	A. g.			
B-2	1 0	Phundani	1,240	1,510
B-3	1 0	Phundani	954	1,205
B-4	0 20	Phundani	300	285
B-5A	0 20	Phundani	354	372
B-6	0 35	Phundani	886	1,053

With regard to the result of comparative tests, the following were the figures of yield :—

	lbs.
C ph 47	102
Punjab 11	97
Punjab 8-A	101

14. *Jacobabad Farm*.—A large area on this farm is always covered by the wheat, grown for seed multiplication of Pusa 12. The area sown during the year was 83 acres as under—

Variety	Area	Total outturn
	A. g.	lbs.
Pusa 12	42 0	44,151
Pusa 12 fresh seed	8 0	6,540
8 Pusa varieties	4 0	2,468
A. T. 38	27 0	24,272
G. S. 25	0 20	241
A. T. 38	0 20	309
Punjab 11	0 20	310
C ph 47	0 20	426

The average outturn per acre of Pusa 12 was 1,051 lbs. that of A T 38, 899 lbs. and of C ph 47, 852 lbs. This average is considerably above the average of the cultivator's yield. The whole of this area was 'Bosi,' i.e., the crop did not receive any irrigation during its growing period.

Results of tests now extending over some years show that Pusa 12 apart from being high yielding is an early ripener and has a quality of grain which commands a premium in the market. It does well under both irrigation and Bosi conditions. Strain A T 38 (Thori) is also a good wheat but is of lower quality and so also C. Ph. 47.

A departure from the routine programme was made this year on this Farm by the cultivation of pure samples of Pusa 12 and other wheats for repeating the baking and milling tests by representative bodies in England. Improved varieties of Sind desi wheats were also included in these tests. The object of the test is to find out the relative practical value of the wheats and not merely their productivity. Reports on the tests are expected shortly. In the meantime it will be interesting to record the figures of outturn of these wheats. Acclimatized Pusa 12 yielded at the rate of 1,051 lbs. per acre on a large area of 42 acres, Pusa 12 fresh seed at the rate of 817½ lbs. per acre on an area of 8 acres and the 8 Pusa varieties 617 lbs. per acre on an area of half an acre each.

Certain observations made by the Superintendent, Wheat Farm, on the crop show that—

(a) Dry ploughing with a furrow turning plough like the Rajah conduces to better tilth of the soil and increases its water holding capacity—a point of vital importance for bosi cultivation.

(b) Each plot should receive a soaking of 14" of water and preferably in one dose but if this is not possible two doses should be given in quick succession before the land completely absorbs the first dose of water.

(c) In order to get good stand of crop in kalar plots, land should be copiously irrigated and flooding should be commenced as soon as water is available. By this method the injurious salts are washed down deep into the soil, away from the zone from which roots of the wheat plant obtain their nutrition.

15. *Seed Farm, Mirpurkhas.*—On the Seed Farm 30 acres and 7 gunthas were sown with wheat as under :—

	A.	g.
(a) Punjab 8-A imported from the British Cotton Growing Association Farm, Khanewal ..	19	19½
(b) Pusa 12 received from the Imperial Economic Botanist, Pusa	4	20
(c) Various Sind strains and 8 Pusa varieties ..	6	0
(d) Comparative tests of Punjab 11 and Punjab 8-A..	0	7½
Total ..	30	7

The highest yield of Punjab 8-A was 11-37½ Bengal maunds and the average was 10-10½ Bengal maunds.

Pusa 12 gave an average outturn of 6-4½ maunds, the highest being 6-20 maunds per acre.

In the comparative tests between Punjab 8-A and Punjab 11, both stood practically equal.

Results of the trial of various Sind strains side by side with the 8 Pusa wheats received from Pusa for the purpose of having their milling and baking capacity tested have been recorded by the Botanist, Sakrand, and will be dealt with by him in detail in his report; but the average outturn from this area as recorded by the Farm Superintendent, gave yields at the flat rate of 10 maunds and 24 seers per acre which is equal to the average yield of Punjab 8-A obtained on the same Farm.

The experiment laid down by the Superintendent with the object of studying the effect of closer sowing by reducing distance between rows of drilled wheat to nearly half of that in general practice, gave about 1 maund and 35 seers more per acre than the crop with the usual wider rows.

Another experiment undertaken was to sow gram in alternative rows of wheat. This did not give any definite result as the gram did not stand irrigation which had to be given to wheat and consequently failed to come to anything.

The experiment will be repeated next season when it is proposed to substitute Matar for Gram.

In the trial of Punjab 11 and Punjab 8-A wheat in the district it is satisfactory to note that the results are favourable. Mr. L. T. Shivdasani, a zamindar of Hyderabad district, who obtained a yield of 1,040 lbs. per acre from Punjab 11 wheat in spite of the heavy frost of last year, is multiplying the seed very rapidly for use in subsequent years.

Mr. H. B. Shivdasani, M.L.C., another zamindar in the same district who imported 35 maunds of Punjab 8-A wheat from the Punjab through the Department is satisfied with it specially as he says because it is resistant to rust a disease very common in Lar tract owing to heavy dew falls. He too is multiplying the seed on his Farm.

16. *Cotton Improvement*.—The varieties of cotton dealt with as the most suitable under present conditions of unstable water supply were the following:—

(a) 27 W.N. .. A strain of white flower narrow lobed type isolated from Sind desi cotton.

(b) Punjab 4F and 285F. . Imported from the Punjab.

The seeds of the above are being maintained in a state of purity from year to year and multiplied through the departmental agency under a somewhat elaborate organization till the fourth generation when seed reaches a figure sufficient to sow about six thousand acres. At this stage the organization passes, subject to the supervision of the department into the hands of the seed growers and the leading buyers. The Department follows the seed for a generation more and then the

seed merges into the general cultivation so that it is not possible for the Department to follow it further. The ordinary local seed is now so much charged with the Departmental strain of 27 W.N. specially in the Jamrao tract that the buyers pay for the stuff entirely on the basis of N.R. rather than make any distinction as they used to do between desi and N.R. before.

Under the multiplication scheme, the total area sown on the Seed Farm Mirpurkhas was as under :—

Variety	Area	
	A.	g.
4F	23	34
27 W.N.	43	13

Germination on the whole was excellent and good outturns were expected but due to heavy floods caused by unprecedented rainfall, practically the whole area was destroyed. A small crop that survived gave a very poor yield, the highest in the case of 4F being 706 lbs. and that in the case of 27 W.N. 333½ lbs. per acre.

The ginning percentage of 4F American as tested on the Farm was found to be 34.3 and that of 27 W.N. as 38.6.

17. *Chellaro Plot*.—The Chellaro plot had the following area under cotton in the year under review :—

Variety	Area	
	A.	g.
4F	120	0
27 W.N.	261	1

Here also the crop was damaged by heavy rains and floods and whatever crop survived did not give good yield. It came to 398 lbs. per acre in case of 4 F and 240 lbs. in the case of 27 W.N.

Miscellaneous

18. *Gram and Matar*.—The popular leguminous crops of the Rabi season in North Sind are Gram and Matar. These are grown chiefly at Jacobabad and Larkana Farms and to a small extent on the Mirpurkhas Seed Farm. During the year under report the crop on the Seed and Larkana Farms was very sluggish in growth. The yield on the Larkana Farm came to only 400 lbs. per acre while on the Seed Farm it was fed to cattle.

19. At the Jacobabad Farm the only possible leguminous crop of the Rabi that can be grown under Bosi condition is gram. This is grown in rotation with wheat which follows it in the next Rabi. It is satisfactory to note that the Farm Superintendent was able to put as much as 64 acres 18 gunthas under this crop as against the average of 29 acres

in the past three years. The variety of gram was white and was originally imported from Pusa under the name of Pusa 6.

The first growth of the crop was as usual, fed to Farm cattle by tethering them in the field. This gave the land the benefit of the cattle dropping and also saved cost of cutting.

The second growth was left to seed and gave an outturn of 799 lbs. per acre.

20. *Berseem*.—This is a fodder crop originally imported from Egypt. As a fodder and restorative crop Berseem has proved of immense value where irrigation facilities exist.

In Egypt, it is considered to be the "key" to cultivation of alkaline lands and is the backbone of Egyptian agriculture. Of the Government Farms in Sind, it is now possible to grow this only at the Willingdon Cattle Farm, Sukkur and Larkana, although Mirpurkhas Farms in the early days of the Jamrao used to grow very large area under it and were consequently in the high state of fertility. The area under this crop on the Willingdon Cattle Farm was 5 acres 36 gunthas while Sukkur Farm had 17 acres and the Larkana Farm 9 acres 25 gunthas.

The crop on the Sukkur Farm was damaged in its initial stage by a swarm of locust which visited the station in the first week of November. The plots which were thus damaged were watered to enable the leafless stubbles to put on fresh leaves and also some seed was sprinkled in gaps where stubbles too had been eaten up. Locusts came again and did some more damage but inspite of this and also inspite of the touch of frost in January the crop grew tolerably well and gave an average yield of 24,000 lbs. of green fodder per acre. On the Willingdon Cattle Farm the yield came to 26,734 lbs. per acre while the Larkana Farm got 7,092 lbs. per acre.

Berseem is now largely grown at Hyderabad by private persons under irrigation from the Phuleli canal. The area is yearly on the increase. The quantity of seed imported from Egypt during the year under report was 58,000 lbs. of which about 2,630 lbs. were distributed among zamindars.

Much progress in the cultivation of this crop cannot, however, be achieved till such time as the production of seed on a large scale locally becomes an accomplished fact. Experiments in this connection are in progress for some years now both on the Larkana and Sukkur Farms and the results show that seed can be produced from three to four Bengal maunds per acre and that North Sind suits the production of seed better than South Sind. With the advent of settled conditions of irrigation it will be possible to explore further possibilities of seed production in Sind.

During the year under report plot D2 on the Sukkur Farm covering an area of one acre yielded 210 lbs. of seed after giving two cuttings of green fodder while at Larkana 3 acres yielded 470 lbs. of seed or 157 lbs. per acre.

21. *Elephant grass*.—This is another fodder that is being grown at the Willingdon Cattle Farm, Sukkur Farm and Seed Farm, Mirpurkhas, on a small scale.

22. *Manurial trials*.—The use of Sulphate of Ammonia as a substitute for cow dung for raising rice seedlings as demonstrated by the Larkana Farm and on which two separate leaflets have been issued by the Department is now getting more and more popular and an agency dealing with this chemical manure has now been started at Larkana to meet its growing demand.

Ammonophos a compound of Ammonia and Phosphate supplied by Messrs. Shaw Wallace & Company, Calcutta, for trial on paddies was tested this year again but the grades used were 13/48 and 20/20 each respectively. The proportion of Nitrogen to Phosphates being 13 : 48 in one and equal in the other case.

The results as tabulated below force one to the conclusion that the higher proportion of Nitrogen in 20/20 grade was in no way more profitably utilized for higher production in this class of soil.

Plot No.	Area	Treatment	Produce in lbs.	
			Grain	Straw
	A. g.			
F-4a	0 10	No manure	185	352
F-4a	0 10	20/20 50 lbs.	469	264
F-4b	0 10	13/48 50 lbs.	452	444
F-4b	0 10	No manure	300	264
F-5a	0 10	No manure	193	132
F-5a	0 10	13/48 50 lbs.	364	308
F-5b	0 10	20/20 50 lbs.	380	264
F-5b	0 10	No manure	216	132
F-7a	0 10	20/20 50 lbs.	305	264
F-7a	0 10	13/48 50 lbs.	340	220

At the request of Mr. S. H. Kerai, Commission Agent, Bombay, the bacterial preparations sent by him were again tried on cotton on the Seed Farm, Mirpurkhas. The seed was prepared according to the instructions given by the Agent and drilled before sunrise on the 12th June. The crop germinated quite evenly and grew very vigorously till it was destroyed by the heavy floods in the end of July.

23. *Crop pest and diseases*.—The most serious pest was the locust which not only damaged the crops but bred in the country on an unprecedented scale. The first report of egg laying came from Chachhro in the Thar Parkar district on the 13th August. The report was followed by reports from Hyderabad, Karachi, Nawasbshah, Upper Sind Frontier, Sukkur and Larkana districts till the pest assumed such enormous proportions that it could be seen not only on the crops but on roads, railway lines, bushes, "maidans," embankments, etc. The locust invasion of the year was unique in its character in as much as eggs

were laid in the cultivated fields, mounds, and all sorts of ground all over Sind instead of in the sandy desert of Thar Parkar and Kohistan and visiting Sind after reaching flying stage as usual. Therefore, the greatest fight that had to be put up was against the pest in its nymphal stage.

The methods actually employed to combat the pest may be described :—

(a) The most important and effective method was found to be the *trench method*. This consisted in excavating a trench, with length varying with the length of the front of the marching column, depth and width varying with the age of the hopper. 2' x 3' trench was generally found to be useful. The sides had to be made very smooth and perpendicular as compared to sloping. Then small pits were dug in the bed of the trench at intervals. The hoppers were carefully driven by mere waving of cloth towards the trench and when few fell in, the others followed and ran into the trench in ceaseless streams till the trench was full. Then with a brush of grass these were gathered in the pits which were afterwards covered with earth and trampled. These trenches were thus again used for driving in more swarms from the opposite side of the trench or both.

(b) *Burning*.—When the hoppers were in clusters, covering bushes or “Kirir”, “Lai” or Babul early in the morning or late in the evening, then burning them by sprinkling kerosine oil over the bushes was found to be useful.

(c) Spraying with fuel oil was also to be effective but the use of a sprayer is essential in this operation. In the same way pestrine and boiling water were found to be useful.

The work of exterminating the pest was not confined to killing of hoppers only but in earlier stages of the trouble eggs were also destroyed in parts of Matli (Hyderabad District) and Sinjhora (Nawabshah District).

Copies of the detailed report on locust operation have been submitted to the Director of Agriculture and the Imperial Locust Bureau at Delhi.

Another pest was the field rat which did some damage to paddy both in Hyderabad and Karachi districts and also to wheat crop in the Jamrao tract. Demonstrations with Cynogas pumps in destroying the rats were given both on the paddy and wheat crops with excellent result.

24. *Fruit*.—The work on fruit is being continued on the Mirpurkhas Farm since its conversion into a Fruit Farm in 1926.

The problems under investigation are :—

(i) The adoption of the principles of fruit growing to Sind conditions with the object of working out the best routine for the management of commercial plantations.

(ii) The investigation on a commercial scale of promising fruits for export purposes, e.g., citrus fruits for juice and the raisin grape for dried fruit.

(iii) The production of reliable young fruit stock for issue to Zamindars.

(iv) The training of skilled mahlies who can be useful to the prospective fruit growers in Sind.

During the year under review, the market value of Marsh pomelo known as "Grape Fruit" was locally worked out. The fruit was not exported to Bombay as the merchants had already imported fruits from South Africa and Jaffa but it was sold locally at the rate of annas four per fruit.

Fourteen grape varieties comprising raisin and table types imported from California, U. S. A., during the year have been planted and are being trained under various methods of training along with the prominent Indian varieties.

The total sale proceeds of fruit, etc., during the year under report amounted to Rs. 1,083-6-0 as against Rs. 1,821-5-2 in the previous year.

Date palm off shoots imported from Iraq and planted on the Sukkur Farm are making satisfactory progress.

There were a few more casualties in the year. The plants now standing in the orchard as noted below :—

Variety				Number of plants
1. Dairi	..	..	..	15
2. Khadravi	..	..	..	4
3. Khastawi	..	..	..	17
4. Hallavi	..	..	..	9
5. Sayir	..	..	..	7
6. Zehdi	..	..	..	9
7. Brain	..	..	..	7
8. Mixture	..	..	..	10
Total ..				78

Two plants out of four of the Khadravi variety have fruited this year (1930) for the first time but the quantity of fruit was small.

25. *Live stock improvement.*—The work in the direction of cattle improvement in Sind consists in the—

(a) Maintenance and improvement of a herd of cattle of red Karachi breed at the Willingdon Cattle Farm (Karachi) and

(b) Maintenance and improvement of a herd of Buffaloes at Government Farm, Sukkur.

26. *Willingdon Cattle Farm, Malir.*—The administration and control of this Farm is vested in the hands of the Deputy Director of Agriculture in Sind, whereas the technical policy is controlled by the Live Stock Expert to Government of Bombay.

The Farm was started in the year 1921 with the object of preserving the red Karachi breed which is recognised to be the best dairy breed in India, eliminating certain undesirable characters in the udder and evolving

a type with strong constitution and high production capacity combined with early maturity and high fertility. The other objects include :—

(i) The production of male calves of known pedigree to supply to the country side as premium bulls for improvement of the breed in general.

(ii) Trial of different kinds of grasses, fodders and forages and study of their nutritive value with a view to effecting economy in cattle food.

During the eight years of the existence of the Farm, substantial progress has been made towards improving the milking capacity, the size and the udder development. It has already been noticed that the heifers which have been calving of late are a distinct improvement over their dames.

During the year under report the Farm had :—

- 2 Cows giving over 7,000 lbs. of milk per lactation.
- 1 Cow giving over 6,990 lbs. of milk per lactation.
- 3 Cows giving over 6,000 lbs. of milk per lactation.
- 2 Cows giving over 5,500 lbs. of milk per lactation.
- 3 Cows giving over 5,000 lbs. of milk per lactation.
- 3 Cows giving over 4,500 lbs. of milk per lactation.
- 4 Cows giving over 4,000 lbs. of milk per lactation.

The above milk figures represent the actual milk in the pail exclusive of the quantity sucked by the calves. The year was marked by the breaking out of foot and mouth disease in spring of 1930 and mammitis in the cold weather of 1929. The heavy yielders were specially affected. The out-break of foot and mouth disease of the previous year (1928-29) was responsible for leaving permanent after effects in certain heavy milkers.

Six bulls were used on the Farm during the year under report and the number of services performed both on the Farm and outside were sixty.

The total quantity of milk produced was 116,489 lbs. and the total sale proceeds amounted to Rs. 5,194-8-1. The number of animals sold during the year was 12 and the number purchased was nil.

The number of births was 34 and deaths 5.

The total strength of herd on 1st April 1930, was as under :—

Breeding bulls	..	..	..	8
Young bulls	..	..	..	28
Cows	..	..	..	41
Heifers	..	..	..	42
Work cattle	..	..	..	14
Castered stock	..	..	..	Nil
Bull calves	..	..	..	20
Cow calves	..	..	..	11

Total .. 164

In the matter of cultivation of fodder and the provision of hay, the area cropped with fodders in Kharif was 24 acres and 18 gunthas and in Rabi 10 acres and 15 gunthas. In addition to this 7 acres and 33 gunthas were under permanent fodder, viz., 5 acres 23 gunthas under Lucerne, 20 gunthas under Guinea grass and 1 acre 30 gunthas under Elephant grass.

The feeding standard of the animals has been reduced to 1 lb. of concentrate per every 2 lbs. of milk production. The composition of the mixture being—

Wheat brain	..	2 parts	} I
Cake (Till, Coconut, Rape)	..	1 part	
Gram Husk	..	1 part	
Roughages dry	..	$\frac{1}{3}$ rd.	} II
Green succulents including legumes.	..	$\frac{2}{3}$ rds.	

This is supplemented by grazing in the "Rakh".

27. *The Buffalo herd.*—The herd started at the Sukkur Farm with a view to investigating the possibilities of mixed farming and also improving the local breed by selection of the best milkers continued to fulfil its object.

The strength of the herd on 1st April 1930 was as follows :—

Adult buffaloes	..	..	..	12
Heifers in calf	..	..	..	14
Bull calves	..	..	..	5
Bulls	..	..	..	3
				34

Births during the year were 8 and death one.

During the year nine animals including adults and male and female calves were disposed of as undesirable, adults on the basis of old age and the others on the basis of constitutional vigour and other points.

The total number of animals remained in milk was 13. The best animal gave 6,355 lbs. of milk per lactation as against 6,459 lbs. in the previous year.

The average per head per annum was 4,947 lbs. as against 3,325 lbs. of the previous year.

Propaganda and Service

28. Intensive propaganda in selected areas, with Taluka as a unit, fixed by Government orders in 1921-22 and subsequently extended at

the recommendation of the Divisional Board of Agriculture in Sind is being carried out in twenty Talukas noted in the margin.

1. Hyderabad.	11. Mirpur Mathelo.	Work in the first 11 Talukas is in the charge of Khan Bahadur Azimkhan, Assistant Registrar, Co-Operative Societies, Sind, with the agricultural assistants working under him and that in the last nine dealt with by the
2. Halla.	12. Mirpurkhas.	
3. Shahdadpur.	13. Jamesabad.	
4. Tando Allahyar.	14. Digri.	
5. Sukkur.	15. Sinjhora.	
6. Ghotki.	16. Nawabshah.	
7. Kambar.	17. Guni.	
8. Larkana.	18. Badin.	
9. Dero Mohbat.	19. Tando Bago.	
10. Shikarpur.	20. Jacobabad.	

Deputy Director of Agriculture, Sind.

Problems in the rest of the Province are also attended to whenever there is a call.

The chief material of propaganda are superior seeds, implements and improved methods of cultivation.

The seeds handled are :—

- (a) The improved strain of desi cotton known as 27 W.N.
- (b) American cotton.
- (c) Wheat.
- (d) Rice.
- (e) Jowar.

The merits of these have been mentioned under the description of each in the pages of this report.

The total quantity of 27 W.N. cotton seed issued to the cultivators during the year under report was as under :—

	lbs.
Produce of the Seed Farm	108,710
Produce of seed growers	366,400

The supply was however, much less on account of the record floods and consequently low outturns. Judging however, from the area actually cultivated the above figures of the seed are far too small to sow even half of the area. It is therefore evident that people have made use of the other sources of supply, viz., ginning factories and the seed growers.

The same remark applies to American cotton mentioned below.

29. *American cotton.*—The variety in demand as usual, was Punjab 4F. The progress in the cultivation of this cotton has been wonderful. The area though fluctuating from year to year depending upon the condition of water supply is nevertheless on the increase as will be seen from the following figures :—

	Acres
1925-26	1,100
1926-27	36,302
1927-28	23,908
1928-29	35,500
1929-30	26,000

The report of the current year (1930) is that the area has gone up to more than two times of the figures of the previous year. This however, requires confirmation.

The cultivation is mostly in the southern section of the Jamrao canal. The quantity of pure seed of 4F variety produced on the Chhellaro plot and on the Seed Farm was 54,990 lbs. This whole quantity was issued to the seed growers for multiplication. For the general cultivation of this cotton, in the district, a large quantity of seed was purchased by zamindars direct from firms. The seed so purchased was from the crop originally raised from the departmental seed and sold to the firms under the multiplication scheme controlled by the Department.

30. *Wheat*.—The kinds and quantities of wheat seeds issued under multiplication scheme were as under :—

	lbs.
Pusa 12	48,835
Phundani C. Ph. 47. .. .	3,485
A.T. 38 Thori	10,447

The bulk of Pusa 12 as usual remained confined to North Sind where conditions for its cultivation are more favourable. C. Ph. 47 and A.T. 38 did also find favour in North Sind.

31. *Rice*.—Selected strains of Kangani, Jajai and Prong are now regularly issued for cultivation chiefly through the Seed Societies in the Larkana district on condition that the Department will have the option of buying back the seed for further distribution. The quantity distributed in the year was :—

	lbs.
Kangani	30,150
Jajai	5,525
Prong	6,251

The crop was rouged at a cost of Rs. 140. The produce has been kept for distribution in the current year.

32. *The Seeds of the selected strains of Jowar*.—Of the five varieties, viz., Allakh, Acho Kartuh, Saoro Kartuh, Bagdar and Red Janpur were issued to five zamindars in Sukkur district. Unfortunately some of the area was destroyed by floods and the produce from the remaining area was rejected as the crop was badly attacked by borer.

33. *Implements and Machinery*.—The rapid introduction of improved implements is amply proved from the figures of the departmental sales

by the district staff which pertain only to Nawabshah and Jamrao tracts—

Name of plough				Number sold
Sarkar ploughs	..	..	..	240
Meston ploughs	..	..	..	203
Bahadur ploughs	..	..	..	2
Hindustan ploughs	..	..	..	2
Hyderabad ploughs	..	..	..	6
Iron Scrapers	..	..	..	3
Rajah fodder cutters	..	..	..	6
Sindhi improved shares	..	..	..	44
Dutch wheels	..	..	..	5
Iron Nars and Hurlas	..	..	..	60

It must, besides, be understood that in case of Sarkar and Meston ploughs and some other implements these departmental sales are being largely supplemented by sales direct from local manufacturers, as a number of small factories for the purpose have now sprung up in the tract. The figures noted above are the return only for the Jamrao and Nawabshah tracts but similar sales are being pushed in other district as well and even in Larkana some local factories have come into being in extending implements recommended by the Department. The popularity of the Cynogas pump to destroy rats in Hyderabad, Karachi and Thar Parkar districts has already been mentioned elsewhere in this report.

Village to village demonstrations with improved implements and seeds have already become routine and are carried out both by the departmental staff and through the agency of Taluka Development Associations.

In addition to the above a show was organised at Nawabshah and successfully run. One of the features of the show was the demonstration with the methods of locust control which was much appreciated.

In the matter of improved methods of cultivation we had our usual demonstrations of sowing cotton in lines as against broadcasting the seed. The method is appreciated by the public as fields can be seen cultivated with this improved method independently where irrigation conditions are favourable.

34. *Mechanical Farming.*—The department organised extensive district itineraries of the International motor tractor in the Middle and East Sind. The demonstration started on the 23rd January 1930 from Deh 43 Nasrat, district Nawabshah, and ended on 25th March 1930, at the tail of the Jamrao canal in Bukhsi Darsansigh's village, giving in all 18 demonstrations. The demonstration was a great success.

Mukhi Gobindram of Sinjhora Taluka has purchased one John Deer tractor and has ploughed more than 350 acres of land. He is well pleased

with its work. Professor S. C. Shahani had also used two tractors of Messrs. Greaves Cotton & Company on rent on his lands in Jamesabad Taluka.

35. A small substation at Jamesabad was again run successfully. It gave a net profit of Rs. 202-4-11. The substation serves as a model for the local cultivators for better cropping.

35A. Among other services rendered to the public were the help given by the Assistant Agricultural Engineer in connection with pumping plants. Sites were visited wherever required and advice given with regard to suitable types of machinery.

36. *Agricultural Bias Schools.*—The number of these schools is nine. Assistance was as usual given to the District Local Boards in holding examinations, directing operations at the school farms and also conducting final examinations and assessing papers.

37. The three Taluka Development Associations under the direct control of the Deputy Director of Agriculture had their usual monthly and annual meetings regularly. They have all along evinced interest in the improvement of agriculture.

38. Advantage of dry ploughing after harvesting the rice lands in increasing future yields, economy in seed rate and early transplanting of rice seedlings demonstrated on the Larkana Farm have been appreciated by the surrounding cultivators. The methods are now in several cases regularly adopted by them.

GULMAHOMED A. R.,

Deputy Director of Agriculture, Sind.

APPENDIX I

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF AGRICULTURE,
POONA, FOR THE YEAR 1929-30

Charge.—Mr. V. G. Gokhale was in charge of this section throughout the year.

2. *Lines of Work.*—As in previous years the lines of work can be put into four sections, viz. :—

- (A) *Teaching.*—This forms the primary work of the section and comprises the subject of Agriculture including Animal husbandry and Dairying as outlined by the Bombay University for the degree of the Bachelor of Agriculture. This represents about half of the total teaching work of the college. For carrying out practical work connected with the above course of teaching this section has to run two of the Department's largest institutions, viz., the College Farm and the College Dairy.

This section has also to do the teaching of Agriculture including Animal Husbandry and Dairying of the Short Course Class and this work forms nearly 70 per cent. of the total instructional work of this class.

Special courses in different sections of Agriculture and Dairy farming are arranged for according to demand and possibilities.

- (B) *Research and Investigations.*—Every member of the staff is almost fully occupied in connection with teaching which is his primary work and the administration of a part of the farm or the Dairy and thus very little free and peaceful time is left for Research as such. Whatever odd and spare time is available is utilised by every member of the staff in conducting small items of Research.

- (C) *The Commercial Working of the Dairy.*—The Agricultural College Dairy besides serving as an institution for teaching, is run on commercial lines.

- (D) *Aid and Assistance to the Public.*—This takes the form of helping the public in obtaining suitable implements and their parts and supplying directly or through reliable firms, any demands for seed of a variety of crops and also giving useful information on a variety of Agricultural enquiries.

3. *Staff.*—With one additional Graduate Assistant for Fertiliser Experiments, the strength of the staff was as follows :—

- 1 Professor of Agriculture in the Indian Agricultural Service.
- 2 Assistant Professors in the Bombay Agricultural Service.
- 3 Lecturers.
- 5 Demonstrators.
- 1 Graduate Assistant for Fertiliser experiments.

Mr. Ranade, Assistant Professor of Agriculture, retired from service on 15th November 1929 and Mr. K. S. Kulkarny has been appointed in his place.

Mr. H. G. Baluch who had been deputed as Secretary, Sind Cattle Committee, returned as Assistant Professor of Dairying and Animal Husbandry and Manager, Agricultural College Dairy, Kirkee, in December 1929 thus relieving Mr. M. M. Desai.

Mr. R. M. Chaudhari, B.Ag., District Agricultural Overseer, Shahada, in the West Khandesh, is the only new person coming to the staff of Demonstrators in the vacancy caused by Mr. Kulkarny's appointment as Assistant Professor of Agriculture.

A—Teaching

4. In all 76 students appeared for the Degree Examination out of which 82 per cent. (as against 87 per cent. of the last year) have passed in Agriculture. There has, however, been no marked improvement in the general calibre.

In the Intermediate Agricultural Examination, there were no failures in Agriculture. The standard of passing here is 33 per cent. In order to get a higher quality of graduates it would appear that this should be raised to 40 per cent.

Even during this year, no additional assistance could be available to make any progress in solving the difficulty of the absence of text books in the subject of Agriculture.

There were in all 16 students that took intensive study of crops for their optional subject, 3 for cotton and allied crops, 12 for sugarcane and allied crops and one for rice and its alternative crops.

The question regarding a general improvement in the quality of students to be attracted to this college may again be emphasized. A prize post, in the higher ranks of service in the Agricultural Department, to be given to a first class first man, if instituted, would very soon help to recruit a much better class of men. This is practised, for example, in the College of Engineering and is a matter worth serious and immediate consideration in the case of this college also.

5. *Special courses given during the year.*—These were as shown below :—

		Days	Students	Remarks
1	Practical management of a Dairy and Animal Husbandry.	55	3	
2	Practical management of a farm.	6	1	
3	Study of implements, manures and crops.	2	12	(Irrigation officers.)

6. *College Farm*.—This farm is maintained mainly to afford all possible facilities in the teaching of Practical Agriculture. Consistently with this main purpose, it also provides land and facilities for carrying out Researches, involving field experiments, by the several sections of the college. A representative collection of indigenous as well as improved implements is specially maintained for the benefit of students as also visitors. A small workshop is run mainly to help in the teaching of carpentry and smithy to the first year students by the Engineering section and secondarily to effect necessary repairs to the farm owned implements as also of the public whenever possible.

An interesting museum of all possible growing crops of the Presidency was specially maintained in both the *Kharif* and *Rabi* seasons and this has been of great help to the students both of this and other institutions.

The area of the farm remained the same as in the last year, viz., about 275 acres of which about 125 acres were under cultivation, the remaining being either under buildings, roads, wells, grazing or waste-land.

The total rainfall from first of May 1929 to 30th April 1930 was 18·92" as against 25·38" of last year and an average of 27 inches. There was some rain (2·10") in April which helped to a certain extent in fining down the plowed soil. The next useful rain was in the last week of June, on which all *Kharif* sowing could be completed in the first week of July and normal germination was secured. August was very precarious with only 1·15 inches of rainfall. By the middle of this month, many crops such as groundnuts, cotton, grain jowars, and fodder jowars on lighter soils showed definite effect of shortage of moisture. Middle of September brought in the long hoped relief, with the total rainfall of 5·61 inches in 5 days. Every crop revived in a few days and improved the prospects.

The rabi season started with 2·36 inches in the first week of October, which though somewhat damaging to the ready crops of bajri and groundnut, further benefited the revived *Kharif* crops still growing and prepared the way for rabi sowing. The subsequent part of the Rabi season was dry throughout except for the little rain of 27 cents in November.

On the whole the season was very trying, the *Kharif* having long breaks and the *Rabi* depending only on its starting moisture.

On the 3rd February 1930, the minimum temperature recorded at this farm observatory was 40°F, the lowest in the year. This was on this farm, of little consequence, the only crops which showed suffering being pumpkins, sweet potatoes and brinjals, the last showing only a light touch.

The effects of this year's season may be seen from the following statement :—

Crops	Average yield per acre	Average yield per acre	Best yield in the history of the farm	
	1929-1930	1928-1929	Per acre	Year
<i>Kharif season</i>	Lbs.	Lbs.	Lbs.	
Bajri	941	1,004	1,632	1912-13
Late G. Nut (Big Japan)	2,284*	2,560	2,768	1913-14
Cotton (N. R.)	995	868	1,900	1919-20
Fodder jowar	5,900	12,738	12,738	1928-29
Tobacco	936	1,599	1,599	1928-29
<i>Rabi season</i>				
Shalu jowar .. .. .	....	2,518	2,578	1928-29
Wheat (Baxi) .. .. .	....	1,068	....	....

Thrips on onions and garlic, aphid on cabbage and red beetle on cucurbits, mildew on peas and downy mildew on kharif grain jowars were severe and did considerable damage to these crops, which could not be controlled by the methods known. The attack of leafcurl of chillies, fusarium of potatoes, rhizoctonia on betelvine were mild this year and wheat rust was almost absent.

Outstanding features of this year's cultivation.—The important dry crops like cotton, late groundnut, kharif grain jowar, kharif fodder jowar Shalu (Winter jowar) all continued to leave a favourable margin over expenses but less than in 1928-29 on account of less yields. Bajri and early groundnuts, though not very unsatisfactory in yield, continued to remain behind the point of profit even more so than last year. Among garden crops "Surans" topped the list of profits (17.6 tons. Rs. 1,091). Lucerne on ridges yielded in its third year an average of 22 tons as against 29 tons of last year. Double beans yielded 3.8 tons against 2.1 of last year but the market rates being unfavourable left only Rs. 92 nett per acre as against Rs. 225 last year. Tomatoes and turmeric and yams and gawar continued to be profitable. Chillies which had practically failed last year gave a good yield so as just to be able to reach a point of profit owing to a much milder attack of "Leafcurl". Onions for seed gave about 512 lbs. seed per acre and have shown a gain of Rs. 225 per acre as against a loss during last year which was due to severe thrip attack. Potatoes both kharif as well as rabi and onions for bulb showed poor returns and loss on account of severe thrips and fusarium on the former and thrips on the latter. The crop of ginger which was profitable last year (Rs. 456) grew very unsatisfactory this year on account of a form of "drying up", the exact cause of which could not yet be identified.

*With one irrigation.

Cabbage as in the past was almost a total failure on account of persistent aphid attack and comparatively warm weather during their active growing period. Brinjal suffered this year heavily on account of Jassides and malformation. Betelvine yielded 121 *kudians* as against 169 of last year owing to unfavourable monsoon season. All these failures indicate very strongly the extreme and urgent need of speedy finding out of suitable remedies against these crop enemies.

7. *The College Dairy*.—The urgent need of some more important breeds of cattle and further modernising the institution from a teaching point of view yet remain unsatisfied on account of financial stringency.

B—Research and Investigation

The following pieces of Research were carried out with the results as detailed against each :—

8. *Accurate preliminary testing of the value of certain artificial fertilisers*.—This work which was started last year departmentally was since January 1930 financed from a grant by the Sir Sassoon David Fund Trustees. A special Graduate Assistant has been given for this purpose.

During the year under report all the crops originally included, viz. chillies, bajri, spanish pea-nut groundnut, onions and shalu (Winter jowar) could be dealt with and the fertilisers tried were the same as in the previous year with the exception of Ammo-phos which has nearly the same composition as leuno-phos. The results are as shown in the following statement which shows the percentage increase or decrease due to the different artificials over the check :—

Name of the treatment	Names of the crops				
	Bajri	Groundnut	Chillies	Shalu	Onion
Ammonium Sulphate ..	16.8	4.9	11.1	9.8	12.7
Sodium Nitrate ..	9.7	— 2.4	12.0	— 15.1	— 3.5
Calcium Cyanamide ..	25.6	— 13.3	8.4	— 10.7	13.2
Leuno-Phos ..	22.2	— 6.7	12.0	— 9.5	10.1
Nitrophoska ..	17.0	..	28.0	— 7.3	2.8

Briefly summarised, it would seem, that except "Nitrophoska" with chillies, the above artificial fertilisers showed no significant results with any of the crops.

It is proposed to continue the experiments next year with as many more replications as possible.

9. *Effect on soil of artificial manure with or without organic matter*.—This experiment was taken up in the year under report. The crop grown was cotton. The following treatments were compared :—

(1) No manure at all.

(2) Farm yard manure only, 2½ cartloads per acre,

(3) Farm yard manure, $2\frac{1}{2}$ cartloads *plus* sulphate of ammonia 10 lbs. N per acre.

(4) Sulphate of Ammonia only, 10 lbs. N per acre.

The results are as shown in the statement below which shows percentage of increase over no manure :—

Name of manure	Percentage
Farm yard manure alone	15·9
Ammonium Sulphate alone	21·7
Farm yard manure <i>plus</i> Sulphate of Ammonia..	32·6

10. *Influence of the weight of seed on the yield of cotton.*—With a view to find out to what extent weight of seed influences the yield of cotton, an accurate investigation was taken up during the year. Banilla “mass” seed and Banilla “selfed seed” were used. Seeds, after treating with sulphuric acid to remove all fuzz, were separated into different grades of weight. Those that sank in a 5 per cent. common salt solution were taken as “heavy” and those that floated over ordinary water were taken as “light.” Ungraded seed was also included in the comparison.

The results show that “heavy” seeds gave a better and speedier germination than the “ordinary” seed which in its turn stood superior to “light” seed.

In the matter of growth, as observed in September 1929, the “heavy” seed gave a better average growth than the “ordinary” and the latter was better than the “light.”

In the matter of final yield of seed cotton, taken per plant, the results have been as follows :—

	Selection	Percentage increase over	
		“ Ordinary ”	“ Light ”
<i>Mass Seed</i>	“ Heavy ” ..	2·1 (Not significant).	11·2 (Significant).
	“ Ordinary ” ..	....	9·1 (Significant).
<i>Selfed Seed</i>	“ Heavy ” ..	7·0 (Not significant).	12·4 (Not significant).
	“ Ordinary ” ..	....	4·9 (Not significant).

11. *Relation of vigor of chillie seedlings to their final yield.*—Seedlings grown on raised beds, manured with 1·25 lbs. sulphate of ammonia, 5 lbs. sulphate of potash and 6 lbs. superphosphate per 100 square feet of bed area, in addition to the usual dose of farm yard manure, showed the best vigor, as judged by (a) the weight of seedlings per pound and

(b) the average root penetration of the seedlings. From the former point of view the seedlings grown in raised beds *plus* complete artificial fertiliser showed an advantage of 122 per cent. over seedlings grown in flat beds and 40 per cent. over those grown in raised beds only. From the latter point of view the seedlings grown on raised beds with complete artificial fertiliser showed 40 per cent. advantage over both the other methods. This confirms the last two years results.

When the effect of the added vigor of seedlings on the final yields was tested in replications with randomised arrangement of the treatments, as against the single comparison last year, it has been found that extra vigor does not result into significant increases in yield, contrary to the substantial increases produced last year.

12. *Broad ridge method for root crops under Poona conditions—*

(a) *Ginger*.—Having obtained some indications that the broad ridge method may afford better conditions for ginger as against flat bed method, a systematic comparison was instituted both on heavy and light soils. Under both these conditions the yield of broad ridge method is about 140-160 per cent. better than in the flat bed method. Incidentally it has been known that the yield on lighter soil has been over 200 per cent. better than on heavy soil. This clearly emphasises the great necessity of good aeration for successful growth of ginger.

(b) *Suran (Elephant's foot)*.—The results with this crop are in great favour of the broad ridge method both in light as well as heavy soils as shown by the following figures:—

	Light soil lbs. per acre	Heavy soil lbs. per acre
Broad ridge method ..	45,800	53,168
Flat bed method ..	25,104	35,012

(c) *Kharif potatoes*.—For this crop also the broad ridge method has indicated a decided advantage as shown by the following figures:—

	Yield per acre lbs.
Broad ridge method .. .	3,476
Bed method ..	1,276

The crop on the whole suffered much from drought, thrips and fusarium and hence the yield per acre even in the broad ridge method has been much below normal.

13. "*Mother Sets*" vs. "*Finger Sets*" of *Turmeric*.—This experiment was laid out to verify the experience of Satara cultivators in favour of the mother sets. The mother set crop gave 24,296 lbs. of green turmeric as against 16,236 lbs. of the finger set crop and thus confirmed the popular belief.

14. *Storage of kadabi (jowar dry fodder) by different methods.—*

(A) During the Presidency Agricultural Show of 1926, three kinds of fodder stacks were made for demonstration purposes, viz. (1) The

Southern Maratha method on ground covered with clods of soil, (2) A round stack with conical top, and (3) a rectangular stack of chaffed fodder lined with Kadabi bundles on the side as also on the roof. Nos. 1 and 2 had whole bundles.

These stacks were kept on for three years to study how the fodder would keep. Each year a part of the fodder was got analysed and also given to cattle as a test.

In No. 2 (Round stack), owing to defective construction, the top sank in and rain water got through. The loss in one year amounted to about 44 per cent. due to rotting. This was therefore given up after one year.

In No. 1 stack, it was noticed that in three years the colour only slightly changed from yellow to brownish. The cattle ate with relish for the first two years while at the end of the third year they refused about 25 per cent. of the quantity given. For the first year, about 2" all round was seen spoiled. For the second year spoiling proceeded to 3" on sides and 6" on top while at the end of the third year the sides showed 4" to 6", and the top 6" and more as spoiled part. At the bottom the spoilage increased from 1" in the first year to 4"-5" in the third year.

In the third stack, the colour remained quite normal throughout. Cattle ate the fodder quite well during all three years. Spoilage has been practically none so far. This stack is still maintained for further study.

The Chemical analysis of the samples of good fodder from the different stacks done each year showed a steady decrease of moisture from 9 per cent. in 1927 (about a year after storage) to about 3 per cent. in 1929, i.e. three years after storage.

(B) In order to ascertain, in a systematic way, the changes in air dry fodder stacked in the dutch barns with open sides and covered top, a special experiment was laid out during the year under report. The results so far show that the stack shrinks in height by about 15 per cent. and in weight by about 20 per cent. in six months.

15. *A cheap and efficient Silo for the Deccan.*—The cement lined silos constructed by the Dairy have stood alright through the third year after construction.

16. *Developing of higher milk yield in cows and buffaloes along with early maturity and regularity, by breeding.*—A definite scheme for improvement of Sindhi cows and Surti buffaloes by in breeding, line breeding and grading has been in progress. It is a matter of years to bring about a substantial result but in a period of about 20 years the annual milk yield of the herd has been increased from 2,200 lbs. to 3,000 lbs. in case of cows and about the same in case of buffaloes.

17. *Value of different roughages, green as well as dry for Dairy animals in the Deccan.*—

(1) *Green Nilwa (Jowar) vs. green maize.*—It was found that green maize was consumed by 9 per cent. more than green Nilwa Jowar on dry matter basis resulting in an increase of milk flow by 6 per cent.

(2) *Green Oats vs. Maize silage*.—The experiment is still incomplete.

18. *Requirements of concentrates for Dairy animals in the Deccan*—

Tur chuni and its value in feed mixtures.—Reductions of one pound of tur chuni showed a drop of milk by 3 to 3½ ozs. or 2.50 to 3.25 per cent. per head per day.

This reduction however, at the present average market rate for chuni, meant a profit of 6 to 7 pies per head per day.

19. *Other experiments*.—In addition to the above systematic experiments a number of simpler experiments were given to the final year students to give them a practice in experimentation methods. The following results are noteworthy :—

	Name of Crop	Nature of Experiments	Remarks
(1)	Kharif grain jowar (Elichpur).	Distance between lines 18" vs. 24" (4 replications).	24" wide sowing showed 1 per cent. increase in grain and fodder as against 13 per cent. of last year.
(2)	Do.	Large grade vs. ungraded seed (4 replications).	Large grade seed showed an increase of .12 per cent. in grain and 3 per cent. in fodder.
(3)	Cotton	N.R. vs. Banilla (4 replications).	N. R. gave 27 per cent. more seed cotton per acre.
(4)	Do.	Dibbling vs. country drill sowing vs. Schutte drill sowing.	Dibbling gave 20 per cent. more return of seed cotton per acre than either of the other two.
(5)	Lucern (third year).	Bed vs. Ridge (2 replications).	Ridge method gave 6,756 lbs. more green fodder per acre than the bed method.
(6)	Do.	F.Y.M. vs. F.Y.M. plus Superphosphate (4 replications).	F.Y.M. plus superphosphate (300 lbs. per acre) gave 6,342 lbs. more green fodder per acre.
(7)	Groundnut	Dibbling 120 lbs. seed per acre vs. drilling 60 lbs. seed per acre.	The greater seed rate has given 699 lbs. more pods per acre.

20. *Trial of implements*.—During the year under report a number of implements were tested and the results are indicated below :—

(1) *The Monotrac Tractor*.—This is a small 3½ H.P. tractor of Geo-Munro, Ltd., Hertfordshire, England, sent for trial by the Agricultural Engineer. It could draw a pair of cultivating tines and shovel hoe about three inches deep. A small set of ridging wings opening about 10" wide furrows could also be worked about 2½" deep in loose soil. Attempt at deeper penetration stopped the tractor engine at once. As no extensive trials could be done no data regarding petrol requirements etc., could be found out.

(2) *A Turnwrest Plow (C. T. Type) from the Cooper Engineering Works*.—The firm, as a result of suggestions, fitted up longer and better placed handles and sent this for trial. This plow was tried in December 1929; in medium black soil. It gave an average depth of

8.39 inches. The moisture percentage in the soil was 13.5. The average draft was 9.8 cwts. The handles were much more convenient for handling and rocking the plow, their measurements being—length of handles 3'-7", height from ground 2'-8".

(3) *The Hindoostan Harvester*.—This was sent by the Farm Machinery and Implement Co., Bombay. This is designed for one bullock and has for its cutting work a single long knife fixed at an angle so that as the platform is drawn through a line of crops, the knife cuts the stem through. This was tried on Kharif Fodder *Jowar* and it was found that it would cut one line 12" apart at a time and an area 10 to 15 gunthas in a day of 8 hours. The machine has to be stopped frequently in a thick crop to clear off the cut material. The draft was 1.4 cwts. Thin stalked plants were found to be left uncut.

(4) *Major A. Steinmetz's Combined Tillage Implement*.—This is a light combination implement consisting of two plow bottoms, discs and hoes, any one of which may be fixed on as desired.

(a) The two ploughs are landside, cutting about 5.5" and 6" deep and 8" broad giving a draft of 2 to 2.5 cwts, in a fairly medium black soil in the month of January.

(b) Fitted with discs, the implement makes a small light disc harrow, 8 × 10". In unplowed land it cut $\frac{1}{2}$ " deep with a draft of 1.75 cwts. In plowed land it did not do well with harder clods and only fair with soft clods.

(c) The hoeing parts work like the shovel or tined hoes of the usual makes giving 3"-5" deep, giving good quality of work.

(5) *H. & C. Hand Cultivator*.—This was sent by Messrs. Jessop and Co., Bombay. This has two long wooden handles, in opposite directions, between which is a head piece, set at right angles, at the bottom of which are 5 curved cultivating blades, 3 facing one way and the rest 2 the other way. The distance between each of these is 5". The one striking limitation of this hoe is that it can be used only in rows 2½ feet apart. There is *no arrangement* to increase or decrease this. It penetrated about 1" deep with a draft 23.12 lbs. and can do about 2.5 acres in a day. The cost is quoted at Rs. 28. It does not work quite in balance.

(6) *Schutte's Improved Seed Drill*.—This was tested for the Agricultural Engineer to Government, for *Jowar* and *Cotton*. The draft of this improved drill came to 299.6 lbs. and 372.7 lbs. in the Kharif and Rabi sowings respectively as against 139.6 and 173.6 of the country drill. The percentage of gaps for the new drill was 18.75 in *Jowar* and 24.33 in *Cotton* against 26.76 and 44.3 for the country drill but in the final yield the effect of these differences in gaps was not so marked.

(7) "*Kinkade*" *Garden Tractor*.—This is a small (2½ H.P.) tractor controlled by a man walking behind. It is simple. This was tested on behalf of Mr. Sim Stadler, of the Indo-American Farm Machinery Agency, Bombay, for plowing, interculturing in *Cotton* and *Jowar* and fodder cutting. Plowing it could do about 3 to 4 inches deep in only moist conditions of soil. Intercultivation work with tines etc. it did

well. Chaff-cutting was also done well enough on small sized rotary cutters. The cost of a set was given as about Rs. 1,000.

The tractor works entirely on petrol and it was found to require about $1\frac{1}{2}$ gallons per day to work a plow cutting about 3 inches deep.

C—Commercial Working of the College Dairy

21. Though the principal object of this Dairy is to afford facilities for the practical teaching in the subject of Dairying and Animal Husbandry to the students of the Poona Agricultural College, it has also for its object the investigation into the scope and methods of Dairying as a business concern along with operations of breeding pedigree animals of Sindhi cows and Surti buffaloes for higher performance.

The year under report began with 236 heads of cattle and ended 220 consisting of 23 cows, 32 young cowstock, 67 buffaloes, 66 young buffalostock, 5 cow breeding bulls, 3 buffalo breeding bulls and 24 working cattle. The difference was due to disposal of greater number of animals than the additions during the year either by new births or direct purchase.

The following statement shows the performances of the milch animals in the year under report as compared with 1928-29 :—

Year	Cows		Buffaloes		Average annual yield of milk in lbs. per head on total			
	Total	Milking	Total	Milking	Cows		Buffaloes	
					actually drawn	after feeding	actually drawn	after feeding
1928-29 ..	28' 70	23' 30	66' 40	53' 60	2,893' 5	2,443' 8	3,278	3,010' 2
1929-30 ..	26' 34	22' 47	71' 28	51' 04	3,398' 5	2,943' 8	3,255	3,075' 0

The increase in the average yield per cow by 500 lbs. over that of the last year is due to the less number of dry days by 6 per cent. as compared to the last year as also to the elimination of less productive animals. The yield of buffaloes remained almost stationary.

The financial aspect of the year under report as compared with 1928-29 is shown in the statement below :—

Year	Total milk produced	Total milk fed to calves	Total milk disposed of	Cost of producing 100 lbs. of milk available for disposal	Money realised for 100 lbs. of milk
	Lbs.	Lbs.	Lbs.	Rs.	Rs.
1928-29 ..	298,318	28,302	270,016	16' 69	17' 45
1929-30 ..	321,403	24,675	296,728	21' 05 (16' 77)	18' 6

Figure in brackets indicates cost of producing 100 lbs. of milk excluding charges for land rent, depreciation, difference in valuation of animals and interest on capital.

The cost of producing 100 lbs. of milk is more by about Rs. 2-6-0 due to taking into account the following items of cost during the year under report but which were not so done during the previous years :—

	Rs.
(a) Land rent	4,000
(b) Depreciation on buildings ..	3,294
(c) Difference in valuation of animals ..	2,690
(d) Interest on Capital	3,700
Total ..	13,684

This year the realization for 100 lbs. of milk produced is about the same as last year including milk fed to calves while the realization in previous years was calculated on the quantity available for disposal after feeding the calves. This increase is due to the sale of larger quantities of milk as such being possible on account of the Hospital Contract.

The total area under fodder crops was 184 acres of which 105 acres were cropped only once and the remaining was made up by cropping 32 acres and 20 gunthas more than once. The total fodder produced averaged about 20,000 lbs. green weight per acre. The yield of lucern went down to 31,700 lbs. per acre from 36,390 of last year due to an experiment to see how the crop would fare on farm yard manure alone without being supplemented by poudrette. The remaining fodder crops yielded more or less the same as last year except Maize at the Manjri area which was less by 8,500 lbs. per acre due to non-manuring. Due to the lower yield of lucern and maize the cost of producing 100 lbs. of green fodder averages at 6·8 annas as against 6·5 of last year. The area of 50 acres suitable for grazing furnished full forage to about 40 adult animals for about 40 days from the last week of October to the end of November as against for 30 animals in August and November and for about 50 animals in September and October in the previous year owing the less rainfall during the year under report.

D—Aid and Assistance to the Public

22. *Implements*.—Requests for supply of implements and their spares still keep coming from various places, though the work of sale of such material on the College Farm, Poona, has now been stopped for some years. Over 75 enquiries were, however, replied by giving information as to the sources from which these implements could be available.

23. *Seeds*.—During the year under report considerable quantities of early groundnuts, N.R. Cotton, *Nilwa jowar* (fodder variety), *bajri* and a few types of vegetable seeds involving in all about 212 indents were supplied from the farm and about 140 indents were directed to other reliable sources.

24. *Help to other sections of the College.*—Help in the form of growing crops and supply of labour and implements etc., was given to the different sections of the College as also to the Central Poultry Breeding Station, Kirkee, and the Agricultural Engineer to Government, to the extent possible, whenever asked for.

25. *Supply of information to the Public.*—In all 146 enquiries on various Agricultural questions were replied to. The number of visitors was about the same as reported last year. Besides this, special facilities were afforded as far as possible to the students of the Male Training College, Poona, Female Training College, Poona, Vernacular Agricultural Schools of Loni, Jambool, Dhulia and Kolhapur and the Nature Study Club, Poona.

26. *Publications.*—The following articles were published in the Agricultural College Magazine during the year under report :—

(1) "Movement of Soil Moisture" by Mr. H. M. Desai.

(2) "Cotton Growing on Community System in Sind" by Mr. K. H. Advani.

The preparation of the Cotton part of an intended text book on Indian Agriculture has been undertaken.

27. *Demonstrations and Shows.*—The Agricultural college farm put up exhibits of crops, implements etc. at the Exhibition arranged by the Deccan Agricultural Association at Khed-Shivapur about 15 miles south of Poona. The College Dairy, Kirkee, gave a demonstration at Bijapur the time of the opening of the Wilson Anti-Famine Institute at Kolhapur on the occasion of the visit of His Excellency The Viceroy and at Khed-Shivapur at the exhibition noted above. In May 1930 a Graduate Assistant was sent to Islampur to teach the subject of plows and plowing in connection with the Land Development class arranged by the Valva Taluka Agricultural Development Association.

Personal

28. All the members of my staff have put in the best of their endeavours and abilities in carrying out their duties.

V. G. GOKHALE,
Professor of Agriculture.

APPENDIX J

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL CHEMIST TO THE GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1929-30

During the year under report I was in charge of the office and the Laboratory of the Agricultural Chemist to the Government of Bombay from the 1st of July 1929 to the 17th of April 1930, and again from the 12th of June to the end of the year. During my absence Professor V. G. Patwardhan, M.Sc., M.Ag., acted as Agricultural Chemist to the Government of Bombay.

2. The work under the Agricultural Chemist may as usual be divided into the following sections :—

- (a) Analytical work done for the Public and for the various sections of the Agricultural Department and other Government Departments.
- (b) Investigation work.
- (c) Teaching at the Poona Agricultural College.
- (d) Water finder work.
- (e) General.

(a) Analytical Work

3. The analytical work includes the actual analysis of samples and also the advice given to the Public based on the analytical figures obtained. The number of samples received for analysis continues to be high. In the year under report 1217 samples were received for analysis. This number does not include any samples analysed in connection with research work carried on in the Chemical Laboratory itself. If the 1217 samples were classified into groups they would be 469 samples of soils, 251 fertilisers, 126 waters, 193 oil seeds, 92 feeding stuffs, 27 milk and milk products and 59 miscellaneous.

4. The samples may also be divided into two groups namely (1) those received from Government departments and (2) those received from the public. Those in the first group number 898 while those in the second number 319. Samples from Government Departments were analysed in connection with the various problems under investigation by the different sections of the Agricultural Department. As in the previous year the Economic Botanist lent the services of a graduate for some time to hasten the analysis of his oil seeds.

5. The samples received from the public consisted of 105 fertilisers, 66 soils, 61 waters, 27 milk and milk products, 21 feeding stuffs, 24 oil and oil seeds and 15 miscellaneous.

(b) Investigation Work

6. Investigation of small problems referred to the Agricultural Chemist is included under analytical work and it is only the larger and definite problems that are included under the heading "Investigation work."

7. The work on the Recuperation of Nitrogen in the Deccan Soils was completed in the year 1928-29. Similar investigation work was taken up in the year under report, with regard to the other important soils in the Presidency and it was completed as indicated in the report of the last year. The results obtained are very valuable. They will soon be put together for publication.

8. As in previous years I co-operated with the Rice Specialist in fixing the manurial experiments on the rice crop at Karjat. The investigation of the assimilation of food constituents by the rice plants has given distinct indications as to the proper time of manuring and also as regard the number of doses of manures to be given ultimately leading to the possibility of reducing the quantity of manure and thus reducing the cost of the crop.

9. The study of the "Karl lands" in the Karnatak was continued. Laboratory and plot experiments were done. They indicate that if the soil of the Karl lands is to give a better crop it must be treated in such a way that it absorbs easily much of the rain water it gets and that it parts easily with that water for the use of the crop. We have gone a step further than last year but the experiments must be repeated this year for confirmation of the indications already given.

10. In the year 1928-29 the Professor of Agriculture carried on certain manurial experiments on *Rabi Jowar*. He found that the manures which were sown between rows of plants, had practically no effect. It was suspected that perhaps the manures did not move enough to be within reach of the roots of the crop. This led to the suggestion that the movements of manures in the typical soils of the Bombay Presidency should be studied. This problem was taken up by the chemistry section at the suggestion of the Director of Agriculture. Some results have already been obtained and further work carried on.

(c) *Teaching*

11. I am responsible for the teaching of Chemistry and Geology to all the classes at the Poona Agricultural College. The teaching work has increased in recent years and it is necessary to add one Demonstrator to the Chemistry staff to keep up the standard of teaching. None of the staff gets any time to devote to research during term time. Everybody is, however, anxious to carry on some research and does what best he can during vacations.

12. One of the members of the staff Mr. B. H. Ghatikar obtained on his research work the Master's Degree in Agriculture of the Bombay University in the year under report. At present one student is working for the Master's Degree in Science and another for the Master's Degree in Agriculture. One more was admitted in June. So I have three Post Graduate research students working in my laboratory. One of them will be ready with his thesis in about 8 months more.

(d) Water finder work

13. There are four machines under me at work. Till the beginning of the year under report two of the machines were engaged in testing sites located by Major Pogson who worked as Water Diviner to the Government of Bombay and the other two were used for the public to locate and test sites for those who applied for the services of the water finder. Now all the four machines are available for the public. Last year 413 sites were tested for the public while this year the number went up to 746. Poona District had the largest number namely 159 sites. Sholapur District with 137 sites came next, followed by Thana District with 119 sites.

14. A special feature of this year was that four municipalities requisitioned the services of the water finder. Baroda State sent two men to take training in the use of the water finder machine. They had a machine of their own and thus they were able to carry on actual tests with our workers.

15. Ten sites out of those tested this year were dug and all the wells have got water as indicated. One bore is being taken on the Poona Law College grounds. Only small quantity of water has been struck so far and further boring work is going on at present. Reports have also been received that a well and six bores have been taken on the sites indicated last year and they have all proved to be successful.

(e) General

16. *Publications.*—During the year under report the following two Departmental Bulletins were published by the Chemistry Section.

Soils of the Bombay Presidency by D. L. Sahasrabuddhe, M.Sc., M.Ag., Bulletin No. 160 of 1929.

Cattle feeds of Western India, by D. L. Sahasrabuddhe, M.Sc., M.Ag., Bulletin No. 161 of 1930.

The articles published in the Agricultural Collge Magazine do not need special mention here.

17. *Staff.*—I am glad to say that all the members of the staff worked satisfactorily. Mr. S. B. Tambekar, the permanent clerk of the office was on leave for eight months and his substitute was new to the work. This caused great inconvenience.

D. L. SAHASRABUDDHE,

Agricultural Chemist to Government,
Bombay Presidency, Poona.

APPENDIX K

SUMMARY OF WORK DONE UNDER THE ECONOMIC BOTANIST TO
GOVERNMENT OF BOMBAY, POONA, FOR THE YEAR 1929-30

During the year Dr. W. Burns was in charge of the work from 1st July to the 6th of September 1929 being subsequently appointed Acting Director of Agriculture, Bombay Presidency, Poona, and in the remaining period of 9 months Professor G. B. Patwardhan acted as Economic Botanist. Mr. L. B. Kulkarni acted as Assistant Professor of Botany, Mr. L. G. Kulkarni taking his place as Assistant Economic Botanist.

The work under the Economic Botanist may be divided into six parts :—

(1) Supervision and control of all botanical researches throughout the department.

(2) Researches of bajri, grazing lands, eradication of weeds like lantana and mimosa, etc.

(3) Educational work.

(4) Advisory work on Economic Botany such as economic uses of plants, plant identification, etc.

(5) Running a small demonstration garden.

(6) Miscellaneous.

1. *Supervision of Botanical Researches.*—Most of the work under this head was done by Dr. Burns. Some part of it regarding jowari research was done by the writer.

2. *Researches—(A) Bajri Research.*—The selected varieties were tested again according to Fisher's chess-board, one-eighth acre duplicate trials, Latin Square and Drill Strip methods. The result show that Nos. 37 and 59 still continue to stand high. No. 54 which also stood high, previously has gone down this year the reason may be untimely rainfall conditions, which were unfavourable to early types like No. 54.

Number 1-28 which stood lowest last year (on account of gappiness), has recovered its original high position.

On the whole we can group all these varieties in two main classes No. 59, 37 and 54 going in the upper class and No. 1-28, 20-14, 20-25 standing next in order of merit. Both the classes being above the local, but as compared with Fresh Akola, the first group may be taken as its equal or superior while the second class cannot yet be declared as better than Fresh Akola.

Out of these, 54 is early, 37 medium and 59 late.

Hybridization.—Nos. 54, 37, 59 and local have been used as parents in crosses. Twenty earheads of each of the crosses are obtained. Their hybrid vigour can be tested only next year.

Morphological study of the selected strains.—Isolations based on red stem, red sheath and earhead shape are being made from amongst the pure lines 37, 54, 59, 20-14, 20-25, 1-28. Individuals showing red colour in stem and sheath in some of the above lines have been isolated and they are pure in two generations.

Three Poona strains, i.e. 54, 37, 59 were tested along with selected Akola No. 41-3-13 at Dhulia. The Poona ones were late and tall.

Certain individuals in the progeny of 41-3-13 shows uniformity as to colour, height and foliage. No. 41-3-13-1 seems hopeful. A few promising lines from Dhulia were tried in Poona. There was no special feature as regards vigour in growth nor in yield. As regards earliness, some of the lines from 54 and 37 are equally early as Dhulia lines.

(B) *Grazing land*.—(a) *Kalas*.—In spite of the defective season, the previous results were confirmed and the trend of vegetation was progressive.

The ecological work was closed on 3rd December 1929. Records taken up to then are being worked up for a fresh memoir.

(b) *Rotational grazing experiments*—*Bhamburda*.—The defective season was responsible for the poverty in growth and forced maturity of most of the grass species.

The animals (average 30) grazed for 8 months in 1929-30 in one herd, being shifted from block to block according to the availability of the grasses. The number of days grazed in each block was 78, 24, 96 and 45.

The area provided feed as follows :—

				Units.
1926-27	..	..	..	3,165
1927-28	..	..	..	5,711
1928-29	..	..	..	6,571
1929-30	..	..	..	7,131

One unit = One animal feed for one day.

Previous conclusions as to the beneficial effects on vegetation, possibility of maintaining cattle up to the end of February and then stall feeding of grass from the areas and the conditions of cattle etc., have been confirmed.

It may be seen that the cost per animal is being reduced.

(c) *Kandivlee*.—Here also the system of deferred and rotational grazing followed by stall feeding with hay-silage was followed. It has confirmed previous conclusions as to the best method of utilizing the grasses. The Gowrakshak Mandali which filled one sample silo pit with 5,225 lbs. grass in 1924 is now turning all superfluous grass into silage every year. In 1929, 129,200 lbs. were so used.

(C) *Castor Research*.—The original commercial varieties have been now botanically classified into 18 groups and their representatives are found to be remarkably pure as to their original morphological characters. Nineteen pure lines out of these were grown and 169 samples were analysed. From a study of the analyses and records of the yields, we have isolated 9 strains which combine high yield and high oil content as their hereditary characters. They are numbered

P.S. 2 ; P.S. 4 ; P.S. 5 ; P.S. 7 ; P.S. 9 ; P.S. 10 ; P.S. 14-a ; P.S. 18 ; P.S. 19.

Their oil contents range from 48 to 50 per cent, with a single exception which gives 46 per cent. Their yields of beans ranges from about 390 to 938 grammes per plant with the exception of one which gives 340 grammes.

Trials at Nadiad.—Six of the selections were tried at Nadiad by Fisher's method under the direction of the Economic Botanist. Four of them seemed hopeful both from point of yield and oil content. These selections are

P.S. 5 ; P.S. 9 ; P.S. 10 ; P.S. 18 ; Their average yield of beans is 334, 290, 122, 299 grammes respectively and the range of oil content has been 44.22 to 56.57 per cent.

(D) *Lantana Eradication.*—The result of the final experiment done in 1928 was assessed in October 1929. The area treated first by cutting with secateurs and small saws was 4.7 acres and then applying sodium arsenite solution. Four representative plots were cleared of grass and the number of plants dead and living was counted. The figures are :—

Area examined	..	..	..	About $\frac{1}{2}$ acre.
Number of plants treated in the area	..	..	..	1,193
Number dead	..	..	..	780
Number resprouted	..	..	..	413
Percentage of dead	..	..	..	65.6
Cost per acre, capital cost of tools.	..	..	..	Rs. 22.2

It was noted that while many big stumps were absolutely dead and dry and could be pulled out with extreme ease, there were many small ones amongst the sprouted ones. These must have missed poisoning or been imperfectly treated.

The position of the plants growing from between and under boulders is very awkward and difficult for handling. Taking this and other handicaps into consideration, I consider the experiment a good success.

(E) *Mimosa Eradication.*—A small preliminary experimental attempt was made of eradication of Mimosa (Touch-me-not) plant which is a rank weed in Kanara District. Two small beds containing one-year-old plants were sprayed with sodium arsenite in September 1929. All the plants died except two or three which sprouted from roots after about three months.

Arsenic was detected in tips of roots beyond 6 inches from the base, in branches of stems 3 inches above ground and in tap roots near the ground. Large scale trials are necessary before anything definite can be recommended.

3. *Education.*—The usual courses in Botany were taught to the students of this Agricultural College. Nine students took Advanced Plant Breeding as their Optional subject. Of these 7 passed the final B.Ag. Examination, one failed and one did not appear.

One post-graduate student was under training for M.Sc. examination which he passed.

In addition, educational help was rendered by this branch in the way of lectures, demonstrations and supply of botanical specimens to various individuals and institutions.

4. *Advisory*.—The number of enquiries dealt with was 60. The number of specimens identified for the public and the department were 158.

5. *Demonstration Garden*.—The Economic Botanist has charge of a small area of about $1\frac{1}{2}$ acres which is principally used for raising plants for class demonstration purposes. Occasionally a few trials at plant introductions are also made. Among the latter may be mentioned the successful introduction and rearing of the following plants:—

(1) and (2) *Casuarina stricta* and *C. cunninghami* two useful fodder plants.

(3) *Acacia nerifolia* from Edinburgh.

(4) *Solanum sanitwongsii* whose fruit is said to be a specific against diabetes.

(5) *Nicotiana alata* N. *rustica*, and *N. glauca* introduced from Edinburgh have now produced seedlings which are successfully transplanted.

6. *Miscellaneous*—

(1) *Publication*—

Name of publication.	Name of writer
(a) "Unusual time of flowering of <i>Cassia fistula</i> " Poona Agricultural College Magazine, Vol. 21, No. 1, July 1929 ..	Prof. G. B. Patwardhan.
(b) "Correlation between Green Colour and Bloom in Castor" Poona Agricultural College Magazine, Vol. No. July 1930	Prof. G. B. Patwardhan.
(c) "Fire—line Burning on Grass-lands" Poona Agricultural College Magazine, Vol. XXI, No. 1, July 1929 ..	Messrs. S. R. Godbole and L. G. Annigeri.

(2) *Seed testing*.—The number of samples tested for the department was 245 which contained many samples sent by the District Agricultural Overseers.

(3) A small waste stony area of about 2 gunthas in the Economic Botanist's charge was planted to spineless cactus. Plants of this cactus introduced into Bagalkot in Bijapur District two years back were reported to be thriving.

(4) Ninety-two types of Jowar earheads samples were supplied to Kew in January 1930.

(5) Seeds of Algaroba, a fodder plant appearing like Babul but having better and edible pods were supplied to the Collector of Bijapur.

(6) The services of one member of the staff Mr. L. G. Kulkarni were lent for the researches of Rabi Jowar Breeding at Mohol.

(7) The research staff and members of the clerical and field branches have all done very satisfactory work in the year under report.

G. B. PATWARDHAN,
Acting Economic Botanist to Government,
Bombay.

APPENDIX L

SUMMARY OF WORK DONE BY THE CROP BOTANIST TO GOVERNMENT
OF BOMBAY, POONA, FOR THE YEAR 1929-30

Introduction

There are two breeding stations under this section. The rice improvement work is carried at the Rice Breeding Station, Karjat; while the wheat breeding investigations are conducted at the temporary experimental plots of the Wheat Breeding Station in the Ganeshkhind Botanical Gardens, Kirkee.

Administration

Mr. R. K. Kulkarni, B.Ag., was the acting Crop Botanist during the year under report.

Mr. S. M. Patel, B.Ag., continued to act as Superintendent of the Rice Breeding Station, Karjat, in the leave vacancy of Mr. V. L. Bhosekar.

Mr. B. Nazareth, B.Ag., held the charge of the Superintendent, Wheat Breeding Station, Kirkee.

Rice Experimental Work

Season.—The rains commenced early enough to enable sowing in the first week of June. There were heavy showers immediately after the sowing. At the time of transplanting there was a break in rains. Though the total rainfall was 91·40 inches—about 29 inches less than the average—it was well distributed throughout the season.

The seasonal check plot of K42.—Since 1923 the strain K42 is grown in a plot of two gunthas to study the seasonal effect; especially the effect on the proportion of straw to grain. The average ratio 0·87, of five years, from 1923 to 1927 inclusive, shows less straw in proportion to grain. Last year, however, the proportion of straw to grain has increased to 1·37. This year also it is slightly more, 1·10, though less than the last year.

No definite explanation can be advanced, as there has been no systematic study of the growth of rice plant under Karjat conditions. It may be that rainy environment during the grain developing period promotes vegetative growth, retarding grain development.

Selections from the hybridized material.—The strain K403 (K39* X K164) was further studied this year. It was found to be splitting last year, but was yielding high. Three outstanding plants were selected from last year's material. All of these were breeding true this year, and had the same flowering date, fineness of grain and more or less the same degree of productiveness. Further selections have been made to confirm the purity of these next year.

Strain K401.—From an identical cross as above, a selection was made which has been numbered as K401. This strain is a week later maturing

*The Female parent is given first wherever both parents are mentioned.

'K' indicates strain involved at the Rice Breeding station, Karjat.

than the rather early strains K79 and K184. It is finest than the two early strains. During the year under report the strain was put in replication and was found to be breeding pure and high yielding.

It was reported last year that the strain K401 has a fineness of 87 grains per gram. This year, however, it is giving only 76 grains per gram. The possible source of error seems to be that undeveloped grains might have been included while ascertaining the fineness of K401 last year. It will be studied further.

Cross 36 (K184 X K104).—This is a cross between the earliest and the latest ripening Kolamba strains. It was in the F5* generation this year. Some desirable selections have been made which have not only combined the best qualities of both parents, but have transcended them in fineness of grain.

Cross 48 (K39 X K42).—This cross was in its F4 generation this year. There were 13 selections made to test the purity of all the important characters next year.

In culture No. 48-834-79 there were two plants which had a fineness of 120 and 126 grains per gram. Such extremely fine grained plants have not been noticed before. The progeny of these two plants will be studied further, especially for the fineness of grain.

Cross 50 (K39 X K104).—This is a cross between the late, fine Kolamba rice and the coarse, very late and high tillering strain of Kolamba. It was in the F4 generation this year. Promising selections have been made for fineness of grain and high yielding capacity.

Replication tests.—Replication tests were carried with selected strains of Kolamba, Zinya and Bhadas varieties.

The Kolamba Strains.—The new Kolamba strains 401, 406 and 415 were replicated against the standard mid-late strain K153. Strain K401 out-yielded the strain K153 in all the five replication blocks, giving significant results. The strain K406 proved to be the poorest of the lot.

There were twelve late Kolamba strains replicated. Out of these, nine were new hybridized selections. The strain K226 has out-yielded K42 in all the six blocks except one. One of the new selections is closely competing the strain K226 and gives a higher mean than strain K42. All the rest were poor yielders.

Zinya Strains.—Five selected strains of Zinya were replicated in six blocks. The selected strains are 111, 129, 44, 117, 81 and Zinya local. None of the strains have proved better than the local, which was originally quite uniform.

Bhadas Strains.—Among the Bhadas strains replicated, only the selection 52 is proving significantly better than the Bhadas local and other four strains. The selection 52 will be once more tried in replication and then released for distribution.

*F5 indicates fifth filial generation of the cross.

The above replication tests will have to be carried at least two years more to make final selections for distribution.

The spread of improved strains.—Since the last six years improved strains of this station are spreading in Konkan. This section supplies each year the purest stock of seed of various improved strains and seedlings of K42 to the Deputy Director of Agriculture, K. D., Ratnagiri, who multiplies and spreads the strains in suitable tracts. Our best late strain K42 has spread over an area of 100,000 acres, mostly throughout Thana and Kolaba districts. Another equally good strain K226, which is not only finer, but as high yielding as K42, is now spreading in Palghar taluka in Thana district.

The early strain K79 is increasing in North Thana and Ratnagiri districts. It is complained of being badly attacked by the storage pest. As a substitute the early strain K184 is recommended. This strain, though it yields somewhat less than strain K79, is finer and more resistant to the storage moth.

The early strain K79 is also spreading in Navsari and Surat districts of Gujarat. The strain K42 was introduced, year before last in Daskroi taluka in Ahmedabad district and in Baroda state.

Quantity of seed distributed.—During the year under report the total of 1,775 lbs. of pure seed of various strains was distributed. Out of this 1,575 lbs. of seed of our improved strains were supplied to the Deputy Director of Agriculture, Konkan, for multiplication and subsequent distribution in his division.

Moth reaction of early strains.—Last year both the strains K79 and K184 were exposed to the attack of storage moth (*Sitotroga cerealella*). The former was found to be affected to the extent of 22 per cent., while the strain K184 succumbed only in 4 per cent. of the cases. From the exposed material of both strains selections were made in plus and minus directions. This year's result show that the selections in plus direction were affected more than the ones in minus direction. The study will be continued further.

Milling tests.—Milling tests were conducted at the near by rice mill, which has a small testing machine. The amount of paddy required for a test is only 10 lbs. The percentage of entire kernels, broken kernels of various sizes, bran, chaff and un-hulled paddy were taken into account.

Among the early strains K401 gave the highest percentage (61 per cent.) of whole rice. Strains K184 and K79 gave 45 and 55 per cent. of entire kernels respectively.

Among the mid-late strains, K406, K164 and K153, there is no appreciable difference between the percentage of whole rice kernels. The range is from 45 to 47.5 per cent.

The late strains tested were K39, K42, K226 and the new strain K412. K39 has given 56 per cent. of whole kernels. K42 and K412 have given 53 per cent. and K226 given only 44 per cent. of whole rice.

The mill tests will be carried again next year.

Wheat Experimental Work

Season.—The year for the wheat crop has been mostly unsatisfactory throughout the Deccan tract. The crop has done well in Nasik and Ahmednagar. There was no rust this year in these districts. In East and West Khandesh the crop was poor due to shortage of rains.

In the Ganeshkhind Botanical Gardens also the wheat suffered much due to the humidity and the cold wave that passed over the cultures in milk stage.

Intensive study of Bansi Strains.—The four selected Bansi strains 103, 162, 168 and 224 were studied intensively and compared with the local Bansi. All the selected strains were found to be pure and susceptible to rust. The rust attack varied from 60 to 80 per cent. Due to the rust attack and the gappy conditions, produced by the death of seedlings in early stages, the results have been vitiated. Therefore, no true value of yields can be given.

Replication of selected strains.—Seven isolated strains 715, 224, 168, 714, 162, 706, 103 and two locals of Nasik and Charoli, were replicated. As usual there were a large number of gaps in the plots and a heavy infection of rust. These two factors have completely upset the experiment. It is not, therefore, possible to gauge accurately and compare the yielding capacity of the replicated strains this year.

It may, however, be mentioned that the calculations based on the yields obtained show, that the strain 715 is appreciably higher yielding than the Nasik local wheat, against which the strains were compared. The strains 162, 706 and 103 are a bit higher yielding than the Nasik local and the rest are considerably below.

Selections of rust resistant types.—Suddhe 11, which was selected from the Suddhe wheat of Ahmednagar, has again proved considerably resistant to rust. It is proposed to test it next year in Nagar district.

The material obtained from Niphad has given three rust resistant selections. Out of these, Niphad 3 has shown considerable rust resistant and given more yield than the other two selections, Niphad 7 and 10.

Improvement of Baxi.—An outstanding selection "S.P. 33" was obtained from Baxi. With an aim to introduce rust resistance the new selection was crossed, this year, with the selected Khapli Strain, 568. The F₂ population will be intensively studied next year.

Hybridization series.—The four resistant strains 806, 807, 808 and 809 were replicated against their female parent 168. All strains mature a week earlier than the strain 168. The replication blocks were greatly damaged due to death of seedlings. Consequently, the yields have been vitiated. However, calculating on the basis of whatever yields obtained, none of the strains have given significantly higher yields than the check strain 168.

District trials.—The various improved strains were sent out for yield trials at various centres in the Presidency.

Nasik trials.—The five rust resistant strains 806, 807, 808, 809 and 810 were tried in two villages of Niphad taluka. At Pimpalgaon and Ozar the selection 809 gave 1,500 lbs. and 1,440 lbs. respectively. These figures indicate about 300 lbs. more yield than the local.

The rust did not appear in this locality.

Trials at Nagar.—The strain 162 was tried against the "Suddhe" local and the Baxi, commonly called "Kala Kusal," at two localities.

At Bhist-bag, strain 162 was grown in a medium blacksoil. Three waterings were given. The yields per acre, of 162 and local "Suddhe" were 1,500 lbs. and 1,224 lbs. respectively.

At Sarola, Baxi and 162 were grown in a light soil and three waterings were given. Here 162 has yielded less than the Baxi. The respective yields per acre, are 704 lbs. for 162 and 800 lbs. for Baxi.

Dharwar trials.—Ten strains were tried at the Dharwar Government Farm. Of these seven strains were from the Wheat Breeding Station, Kirkee, two were "Pusa 4" and "Pusa 12" and the remaining one was a local Red strain. Only two strains 808 and 809 proved somewhat rust resistant. "Pusa 4" and "Pusa 12" suffered badly. The strain 103, inspite of its susceptibility to rust, has given the highest yield; strain 808 is the second best, yielding slightly more than the local Red.

The promising strains will be tried again next year.

Trials at Loni.—At the Agricultural School Loni strains 804, 807 and 808 were tried along with Pusa 4. There was no rust. Two irrigations were given. The strains 807 and 808 out-yielded Pusa 4, while 804 was a less yielder.

Trials in West Khandesh.—The trials at Shahada in West Khandesh proved almost a complete failure this year. The season was quite unfavorable and there was much trouble from "Soil pest." The yields, in almost every case, are extremely low.

Trials at Dholka (Gujarat).—The strain 224 was tried against the local wheat at two localities. At Arnej village the plots were damaged by grass-hoppers. The yields of both local and 224 are extremely poor. At Ranpur village the plots were irrigated. The strain 224 has out-yielded the local by about 200 lbs., the total yield per acre being 2,100 lbs. The grains of 224 were oily in appearance and had 5 per cent spotted kernels.

Summary of the Khapli-Bansi Cross.—A total of 135 cultures in F4 were studied. Of these 69 are breeding pure for one or more important economic characters and the rest are splitting. Seven desirable cultures have been obtained. These have easy shelling, tough rachis, yellow grain of Bansi and rust-resistance nature of Khapli. The flowering range of these strains is distributed throughout the second half of January.

The seven selections will be intensively studied next year.

Suitability of Strains for Different Tracts.—The selection 103 is a late and a high yielding strain. It is suitable for tracts having late rainfall. At Dharwar Farm it has given consistently high yield, and may be a profitable introduction in the transition tract.

Another late strain is 162. It has done well in district trials in West Khandesh and may prove a profitable introduction.

The strain 168 is very early and does well in scanty rainfall. It is suitable for East Khandesh where it has yielded 10 to 12 per cent. more than the local.

For Gujarat, the strain 224 is proving suitable. It has done well in Dholka-Dhanduka area of Ahmedabad. The strain 224 is also suitable for East Khandesh.

Jowar Work.—Mr. R. K. Kulkarni visited the Mohol Jowar Plot to observe and to make further selections from the standing crop.

Out of the sixty original cultures selected in 1928, fifty-eight were grown. Of these, cultures from 50 to 58 inclusive did not germinate well and were subsequently discarded.

From each culture 50 plants, which approximated most the Maldandi variety of Jowar, were studied. Observations were taken each week on the height of plants, and on general confirmation to the Maldandi type.

After harvest the same plants were studied for density and weight of ear-heads; color of glumes; number of grains per gram from top, middle and base of ear-heads and yield of each plant, etc.

Five or six desirable plants were selfed from each culture. The seed from these selfed plants will be grown for further selection next year.

B. S. KADAM,

Crop Botanist to Government of Bombay, Poona.

APPENDIX M

SUMMARY OF WORK DONE UNDER THE PLANT PATHOLOGIST
TO GOVERNMENT, BOMBAY PRESIDENCY, POONA, FOR
THE YEAR 1929-30

During the year under report Dr. B. N. Uppal held the charge of the Section of Plant Pathology.

Mr. M. N. Kamat continued to act as Assistant Professor of Mycology. Mr. J. S. Malelu remained on deputation as Betelvine Investigator, Bassein, and Mr. M. K. Desai acted in his place as Assistant Mycologist.

At the end of the year, proposals for appointing Dr. M. K. Patel as Rice Mycologist with headquarters Government Farm, Larkana, Sind, were approved by the Director of Agriculture, Bombay, Poona. Dr. Patel will make an investigation into the 'rati' disease of rice caused by *Helminthosporium oryzae*. The scheme has been sanctioned for three years and is financed from the Sir Sassoon David Trust Fund.

Education

The Plant Pathologist to Government was assisted by the Assistant Professor of Mycology in the teaching of Plant Pathology at the College of Agriculture, Poona.

There was only one student specialising for the degree course in Advanced Plant Pathology, and he was successful in the University examination. There was one post-graduate student under training until December 1929 when he left us to take up a position as Assistant to the Mycologist to Government, C. P. Besides, a few students applied for admission to the post-graduate course in Mycology; but they were refused admission on account of limited facilities available at the College.

In spite of limited staff, the teaching work was done quite satisfactorily although it can still be improved in many directions. The Director of Agriculture, Bombay, Poona, realising the necessity for the post of an additional Graduate Assistant under the Plant Pathologist, approached Government in the matter; but they were not in a position to sanction the proposal in view of the financial stringency.

Research

In spite of the heavy duties of teaching and advisory work, a large programme of research was undertaken. Results of considerable scientific and practical value have been obtained.

1. *Sulphur treatment for powdery mildew of the grape.*—In the Bombay Deccan the vine may be attacked by anthracnose or downy mildew (which is very rare in occurrence) during the monsoon or early in November if late rains are experienced after the vines have been pruned out in October. Since sulphur dusting is ineffective against these diseases, the question arose whether spraying during the monsoon was necessary to preserve the vigour of the shoots which would bear fruit

in the following cold season. Experiments were therefore made at Nasik and Chakan, in which about one-third of a vineyard was once sprayed with Bordeaux mixture during the monsoon, the other portion received one spraying during the monsoon and another in November after the October pruning, while an equal portion was left untreated to serve as control. All the three portions of the vineyards at Chakan were sulphured during the fruiting season and notes on the control of powdery mildew were taken.

In the sprayed and control plots mildew appeared on the berries and young shoots during the monsoon; but the well developed canes remained healthy. No difference in the vigour of vines was noticeable. During the fruiting season powdery mildew was completely controlled at Chakan in all the plots, and the yield was uniform. It is therefore evident that spraying during the monsoon offers no advantages over the unsprayed vines; but one application of Bordeaux mixture in October (when vines are pruned out in September) may prove useful in checking anthracnose if late rains are experienced.

- The results of the experiments conducted during the last four years will soon be published in a departmental bulletin.

2. *Control of grain smut of jowar.*—Trials on the control of jowar smut were continued in 1929 and gave positive results. Infection was controlled effectively even when 3 ounces of sulphur were used to disinfect 60 pounds of seed.

In order to ascertain whether large doses of sulphur have any deleterious effect on the germination of seed, sulphur was used in varying proportions ranging from 8 to 64 ounces to treat 60 pounds of seed. The seed germinated normally.

Arrangements have been made for the supply of sulphur packets at nine pies each packet. The quantity of sulphur in each packet will treat enough seed to sow eight acres.

A departmental leaflet has been published summarising the results of our experiments on the control of jowar smut. It is hoped to publish the results in detail in a bulletin.

3. *Control of Jiru mildew.*—Trials similar to those conducted last year were made at Boriavi near Nadiad, in collaboration with the Deputy Director of Agriculture, Gujarat. The disease appeared in the control plots; but a thorough search for one hour by three men did not reveal a single affected plant in the dusted plot. However, sulphur dusting has not yet been thoroughly tested, as the incidence of disease in the control plots was not considerable.

It is proposed to repeat dusting on the late-sown crop, as the early-sown crop usually escapes the disease.

4. *Control of fig rust.*—Extensive trials were made with sulphur for controlling fig rust. The applications were made at intervals of 7, 15 and 30 days, and were continued for about three months. The disease was controlled in all the plots, although the control plots did not show much infection. The one-month treatment proved the most suitable

as it did not cause injury to the foliage and young fruits. Sulphur was applied in heavy doses and varied from 120 to 150 pounds per acre per five applications, and the time taken was 32 hours. Figuring at this rate, the cost of treatment per acre does not exceed Rs. 12 although it can still be reduced.

Trials on sulphur dusting will be repeated next year on a large scale.

5. *Gummosis of Citrus*.—It was reported last year that trials were being made with florium, zulite and creosote to determine their effectiveness as compared with the carbolic acid treatment. The disadvantage of the latter treatment is that after the gum-affected portion is treated with a solution of 50 per cent. carbolic acid, it requires to be painted with coal tar to prevent extraneous fungi from entering the wound. Coal tar creosote has given very encouraging results, and extensive trials are now being made at Utran in Khandesh. It is also proposed to test the efficacy of wood-tar creosote.

6. *Macrosporium blight of Jiru*.—This hitherto undescribed disease of Jiru was first discovered in the Kaira district (Boriavi village) in Gujarat. The disease has been shown to be caused by a species of *Macrosporium* which, it is claimed, causes more severe damage in wet years than the powdery mildew of Jiru. A detailed study of the disease and the casual organism is being made.

7. *Wilt of Sann-hemp*.—A serious wilt disease of Sann-hemp is found on the Manjri Farm since 1928. It has been shown to be caused by a species of *Fusarium* which, under controlled conditions, was able to cause wilting of about 88 per cent. plants exposed to infection. Plants growing in infested soil in a glass-house where the temperature rose fairly high during the day, escaped the disease, while those in a cool greenhouse suffered badly from wilt.

Since the disease is of considerable economic importance in the Deccan where Sann-hemp is grown as a green-manure crop in rotation with sugarcane, proposals will soon be submitted to the Director of Agriculture, Bombay, Poona, to approach the Sir Sassoon David Trust for a small grant for an investigation into this disease.

8. *Wilt of betel vines*.—It has been found that during the monsoon a very large majority of deaths in betel vines is caused by a species of *Phytophthora*, and that *Sclerotium rolfsii* is responsible to a much less extent. Field trials made last year have shown that infection by *Sclerotium rolfsii* can be controlled by application of fungicides to the soil; but the discovery of *Phytophthora*-wilt has vitiated the value of these data. However, pot experiments conducted during the year with *Phytophthora*-infested soil have shown that Bordeaux mixture may prove useful in controlling this infection in the field. It is proposed to test the value of this fungicide on a field-scale next year.

A report has been submitted to Government summarising the results of field and pot experiments with both the fungi.

9. *Studies in the genus Sclerospora*.—A very important work of mycological interest has been done on this genus. The results may be summarised as follows :—

(i) *Sclerospora graminicola* var. *Andropogonis-sorghii* not only affects jowar but also maize naturally. Artificial infection of maize has also been secured. This variety differs markedly from *Sclerospora graminivola* in its asexual stage but it very closely resembles the latter in the biometrical measurements of the oospores. In spite of the close resemblance of the two fungi in the sexual stage, the fungus on jowar should be described as a separate species. It is proposed to publish this work shortly.

(ii) It is probable that *Sclerospora graminicola* is split into specialised races.

(iii) There are very strong indications that *Sclerospora maydis* and *Sclerospora philippinensis* are not different from one another.

It was stated in the last report that it was possible to cross inoculate bajri and jowar with oospores on these two hosts and on *Setaria viridis*. These results, however, have not been confirmed.

10. *Mosaic disease of chillies*.—Work on the control of this disease was undertaken on the College Farm and the Manjri Farm. Spraying with Paris green (plus *gul*) and nicotine sulphate was tried. Since the disease did not appear during the year, there was no difference in the yields of treated and untreated plots. The yield obtained in treated plots was normal.

The scheme has been put up before the Imperial Council of Agricultural Research for a grant.

11. *Brown spot disease of rice in Sind*.—The seed was treated with various organic compounds of mercury, copper sulphate and formaldehyde. The floods destroyed the crop in the experimental plots, and no data on the relative effectiveness of the treatments are available.

Advisory work

A large number of enquiries regarding plant diseases were received from the district officers of the Department and the public, and advice was given promptly whenever required.

The plant disease survey of the Presidency including Sind is being made in collaboration with the Divisional Deputy Directors of Agriculture.

Arrangements to demonstrate plant diseases and the appliances for their control at the divisional agricultural shows were made in collaboration with the Divisional Deputy Directors of Agriculture.

Publications

(1) Control of the Grain Smut of Jowar. Bombay Department of Agriculture Leaflet No. 13, 1929.

(2) Uppal, B. N. Mosaic disease of chillies (*Capsicum annuum*) in the Bombay Presidency. Internat. Bul. Plant Protection, N. S., xx, p. 99, 1929.

B. N. UPPAL,
Plant Pathologist to Government, Bombay,
Poona.

APPENDIX N

SUMMARY OF WORK DONE UNDER THE SOIL PHYSICIST TO GOVERNMENT OF BOMBAY, MANJRI FARM, FOR THE YEAR 1929-30

The undersigned held charge of the post of the Soil Physicist during the year under report and there were no changes in the staff.

The problem of Dry Farming continues to be investigated at the Dry Farm Experimental Station at Manjri and the laboratory work mainly consists in the determinations of moisture contents of soils from numerous field plots receiving different treatments. No other work on Physical properties of soils under different treatments can be undertaken for want of additional hands.

Season.—From the points of view of testing the Dry Farming methods any marked deviation from the normal weather conditions is welcome and the season under report was in that respect very peculiar. The total rain-fall during the year 1929 was 17·91 inches. Of this the hot weather rains amounted to 0·71 inches, the Kharip rains from June to middle of September amounted to 6·36 inches while the Rabi rains from 16th September onwards measured 10·84 inches. The total number of rainy days were 71. Of these the rain-fall on 11 days was more than 50 cents in a day, that on 10 days it varied from 15 to 50 cents while on 50 days it was below 15 cents a day. When compared with the average, the Kharip rain was only 60 per cent. and the Rabi rains though sufficient in amount were received only in eight days and hence a great amount of the same was lost from cultivators' fields or from unprepared land. The net result of this distribution of rain on the surrounding cultivation was the failure of Kharip crop and partial failure of crop of Rabi season. But the methods adopted at the Dry Farm Experimental Station enabled us to reap a fair crop of Bajri and Tur mixture and also a good crop of Rabi Jowar.

Experiments with Kharip Crops—Bajri and Tur mixture.—Thorough preparatory tillage consisting of ploughing with a CT2 plough, and three harrowings with a blade harrow was given to all the plots under Bajri and Tur mixture. Experiments were laid in triplicates to determine the effect of bunds over no-bunds, the effect of shallow or deep mulch over no mulch and the effect of the addition of Farm Yard Manure on small units of one guntha area and the results given in the adjoining table are from the average of the replicated plots from the middle squares after removing the rings, calculated per acre. During the peculiar weather and rain-fall conditions of this year the bunds show a distinct advantage over the flat plots. In the bunded series the advantage by mulch varies from 20 to 34 per cent. increased yields in grain and 8 to 24 per cent. increased yield in fodder. The yields of Tur grain in bunded series are on the whole double those in the unbunded.

Other Kharip Crops.—Cotton was tried on a small plot of one guntha with the standard method. It could give about 9 lbs. of seed cotton as compared to nearly 6 lbs. on plots without bunds. Nilwa-jowar grown for fodder and maize could not succeed on account of the continuous long spell of dry weather for over eight weeks.

Rabi Crop.—Shalu Jowar forms the important crop on the Dry Farm and hence numerous experiments in three or four replications are laid down to determine the various factors and to assess numerical values. All the experiments of the previous year were repeated and some new ones were added during the year.

(1) From the figures of yields given in the following tables it would be seen that the bunding series on the whole has given about 7 per cent. more yield in grain as compared to the unbunded or flat series.

(2) The effect of mulching of different thickness is to give 20 to 40 per cent. more grain as compared to unmulched plots in the bunded series according to the thickness of mulch. In the unbunded series the effect is seen only in thicker mulches of 2 or 3 inches to the extent of 12 to 18 per cent.

(3) In the cultivation series ploughing with CT2 plough gives the highest yield in both grain and fodder, the increase over the tine-tooth harrow being nearly 20 per cent. Harrowing with the blade harrow gives the lowest yield in the series, being nearly half the outturn in grain and two-thirds in fodder as compared to the ploughed plots.

(4) The manurial series showed that Sann Green Manuring and addition of Nitrate of Soda both resulted in giving about 10 per cent. more yield than the unmanured plots while not much advantage was seen by the addition of Farm Yard Manure or of Sulphate of Ammonia.

(5) The Cultivators' plot gave only two-thirds the yield both in grain and fodder when compared with the standard method of Dry Farming.

(6) The Economic series where all account of income and expenditure was kept, showed that during the year under report the total outturn per acre is valued at Rs. 74 while all expenses amounted to Rs. 52. Thus the method leaves a fair net profit even to a Capitalist farmer when the rain-fall during the year was nearly 14 per cent. below the average.

District trials.—A very large number of field trials on cultivators' fields were possible as the Deputy Director of Agriculture, S. C. D., took up the problem of Dry Farming for trial in the district with his usual zeal and enthusiasm. The trials in the Ahmednagar district were possible on account of funds placed at the disposal of the Deputy Director of Agriculture by the Collector of the District. The results are encouraging. The trials in the Poona District were concentrated in one place at Talegaon Dhamdhare in the Sirur Mahal and proved successful. The average yield on the 75 acres of land under improved method at the place was 426 lbs. of grain and 1,240 lbs. of straw per acre as compared with the local average of 160 lbs. of grain and 600 lbs. of straw.

The results of Mohol experiments were again inconclusive due to heavy rains and breaching of Tals.

In the Southern Division the experiments were tried on 4 acres at Bijapur and Bagewadi on cultivators' field by the Deputy Director of that Division. At Bagewadi the Dry farming method was tried for both Jowar and Cotton and has given excellent results. The results at Bijapur show only ten per cent. increase in grain and 20 per cent. increase in fodder.

Other Investigation Work—(1) Surface Run-off and Soil Erosion.—The Director of Agriculture kindly placed a sum of about one thousand rupees at the disposal of the Soil Physicist to start a very valuable and important experiments to determine the loss of rain-water by Surface Run-off and of Soil by Erosion. The first year's results are very interesting as well as instructive.

The data collected shows that the number of days on which run-off took place was 11 out of a total number of 71 rainy days of the year. The annual rain-fall amounted to 17·91 inches. Of these 12·94 inches were received on 11 days on which Run-off of rain-water from the experimental plots took place. There were three different plots receiving a different treatment as follows :—One plot was kept unstirred throughout. The other received harrowing with a blade harrow as a preliminary treatment, while the third was ploughed and further harrowed. The rain water lost from the different plots showed that water equivalent to 5·77 inches of rain-fall was lost by Run-off from the untreated plot, 6·14 inches from the harrowed plot, while the ploughed plot allowed as much as 6·51 inches of rain to run over it. This means that the rain-fall lost by Run-off on plots with a three per cent. fall or slope in one direction varied from nearly 32 to 36 per cent. of the total annual rain-fall. If we however take into account the rain-fall on the eleven days on which run-off took place, we find that the water lost amounted to 44 to 50 per cent. of the heavy rains capable of being stored in the soil for the use of the crops.

(2) *Water Requirement of Jowar.*—Experiment to determine the water requirement of Jowar was carried on plot scale during the year under report and the results obtained will be corroborated during the ensuing season before publishing.

(3) *Evaporation of Soil Moisture.*—Data are being obtained with regard to the march of evaporation from month to month under varying moisture conditions of soil.

Propaganda.—Illustrated lectures on Dry Farming at the time of crop demonstrations were given in several places in Ahmednagar and Poona Districts by the Soil Physicist and his graduate assistant.

Staff.—The work at the Head-quarters and in the District is increasing and the existing staff are trying their best to cope with the increased scientific work at Manjri and district field trials on cultivators' fields. Mr. G. M. Bapat, M.Ag., the graduate assistant, put in very hard and conscientious work. The non-graduate assistant Mr. S. R. Gadkari shared the responsibility of additional work. It is hoped that this post which still remains to be temporary is made permanent in the near future. In fact the present inadequate staff very urgently requires to be strengthened to cope with the increased work of the section.

N. V. KANITKAR,
Soil Physicist to Government,
Bombay, Manjri Farm.

*Statement showing the yields of Bajri and Tur during 1929-30
on Dry Farm Experimental Station at Manjri*

	Bajri grain	Bajri straw	Tur grain
	Lbs.	Lbs.	Lbs.
Flat without bunds and kept unstirred ..	305	1,070	130
Flat without bunds and stirred 2" deep ..	327	960	230
Bunds and kept unstirred ..	447	1,622	370
Bunds and stirred 2" deep ..	600	2,027	340

*Statement showing the yields of Rabi-Jowar per acre in 1929 30
at Dry Farm Experimental Station at Manjri*

	Grain	Straw
	Lbs.	Lbs.
Flat without bunds and kept unstirred ..	1,058	1,748
Flat without bunds and stirred 2" deep ..	1,246	2,297
Flat without bunds and stirred 3" deep ..	1,175	1,741
Bunds and kept unstirred ..	984	1,871
Bunds and stirred 2" deep ..	1,255	1,937
Bunds and stirred 3" deep ..	1,389	1,814
Ploughing with CT2 plough ..	1,718	2,318
Harrowed with Tine tooth harrow ..	1,411	1,910
Harrowed with balde harrow ..	812	1,572
Addition of Sann as green manure ..	1,567	3,139
Addition of Farm Yard Manure 8 cart loads per acre ..	1,487	2,268
Addition of Nitrate of Soda ..	1,567	2,289
Addition of Sulphate of Ammonia ..	1,363	2,484
Check plot for the manurial series ..	1,424	2,702
Cultivator's plot ..	844	1,270
Economic Series plot large scale trial ..	1,180	2,273

*Statement showing the yields of Rabi-Jowar per acre on the Experimental
plots on cultivators' fields in the Districts during 1929-30*

				Experimental Plot		Local Method Plot	
				Grain	Straw	Grain	Straw
TALEGAON CENTRE				Lbs.	Lbs.	Lbs.	Lbs.
Poona District							
Plot No.	1	..	..	376	743	225	730
"	2	..	..	140	979	103	942
"	3	..	..	780	1,545	..	612
"	4	..	..	273	763	..	682
"	5	..	..	545	1,810	150	769
"	6	..	..	495	762	210	..
"	7	..	..	410	1,034	330	1,025

	Experimental Plot		Local Method Plot	
	Grain	Straw	Grain	Straw
TALEGAON CENTRE—contd.				
<i>Poona District—contd.</i>				
	Lbs.	Lbs.	Lbs.	Lbs.
Plot No. 8	188	647	..	190
" 9	290	595	240	559
" 10	240	440	182	385
" 11	257	596	163	604
" 12	372	1,131	318	1,078
" 13	407	1,310	144	528
" 14	770	835	Straw fed to cattle.	
" 15	400	914		
" 16	427	713	248	643
" 17	347	556	246	470
" 18	140	429	240	527
			30	312
<i>Ahmednagar District</i>				
Chinchondi Shiral	568	2,240	384	1,700
Karanji	576	1,600	336	1,040
Kandgaon	432	1,200	240	900
Chinchondi Patil	558	1,680	336	1,600
Parner	98	980	68	678
Jamgaon	129	554	114	615
Kanhur	168	528	84	416
Rahuri	360	680	240	520
Sangamner	192	1,008	48	1,088
Jamkhed	136	504	104	440
Kharda	236	592	160	504
Kada	312	872	218	732
Arangaon	272	552	84	468
Shegaon	634	1,152	348	692
Dhor Jalgaon	510	1,620	250	1,040
Erandgaon	388	1,296	264	652
Bodhegaon	240	1,000	144	432
Pathardi	288	1,124	192	1,020
Kelgaon	528	640	288	832
Kashi	528	764	336	992
Pimpri	720	1,120	480	800
Chamburdi	540	800	300	800
Karjat	336	704	240	768
Mirajgaon	864	2,032	600	864
Rasni	576	960	456	1,020
<i>Sholapur District</i>				
Mohol	463	1,030	448	900
<i>Bijapur District</i>				
Bijapur	406	1,010	360	840
Bagewadi	640	1,608	340	820
Yield of seed Cotton per acre at Bagewadi				
	Dry Farming Method		Local Method	
	Lbs. 440		Lbs. 143	

APPENDIX O

SUMMARY OF WORK DONE UNDER THE LIVE STOCK EXPERT TO
GOVERNMENT FOR THE YEAR 1929-30

Charge.—Mr. Ali Mahomed Ulvi, B.Ag., held charge of the Office of the Live Stock Expert for the period from 13th April to 24th December 1929 during the absence of Mr. E. J. Bruen on leave; Mr. Bruen holding charge from the 24th December onwards.

The work of the Live Stock Expert and his staff covers the following :—

- (i) Advisory work.
- (ii) Propaganda and teaching in villages.
- (iii) Improvement of cattle on farms and in villages through the agency of Premium bulls.
- (iv) Holding of demonstrations and shows.
- (v) Sheep and goat improvement.
- (vi) Improvement of the milch buffalo.
- (vii) Poultry improvement on the Government Central Poultry Farm, Kirkee and in the villages.

Advisory work.—Numerous requests from private persons asking for advice in cattle breeding, dairy farming, poultry farming, the housing and feeding of live stock have been received in the Presidency proper and from a number of adjoining Indian States; these were all helped and advised to the best ability of this Office.

The Live Stock Expert has been helping and advising the Bombay Municipality with its proposed improvement in the milk supply of Bombay City. In conjunction with the Deputy Director of Agriculture, Konkan, a scheme is being prepared for the starting of a Dairy District to be located in Palghar, which will not only help the Bombay milk supply but will also be instrumental in stopping the unnecessary slaughter of good milk buffalo, which must necessarily follow from the present system of keeping milch cattle in Bombay City.

The Deputy Directors of Agriculture were advised on all cattle breeding questions submitted to this Office.

Propaganda.—Propaganda on the keeping, breeding and rearing of better cattle were conducted in 67 villages in Northern Division, 51 villages in Central Division and 70 villages in Southern Division.

Demonstrations.—During the year silage making demonstrations and the feeding of silage were held as follows :—

Northern Division	3
Central Division	8
Southern Division	3

Over and above this silage was made and demonstrated at Chharodi, Sangvi, Bankapur and Kandivlee farms. These demonstrations are proving very useful and attracting much attention; if we keep on with this for a few years more, silage making will be a common practice.

Shows.—During the year this Department held and assisted both financially and with arranging the following cattle shows :—

Northern Division	..	..	..	1
Central Division	..	..	..	1
Southern Division	..	..	..	6

These shows have been the means of awakening the people to the utility of keeping better cattle. The show held at Mahud Budruk has been responsible to a great extent in inducing the people to keep good breeding bulls. When the show was first organised and until recently only Government aided bulls were seen at the show, this year it was the reverse, of the 14 breeding bulls shown only 5 were Government aided. This is an advance in the right direction.

Breeding Operations in the district.—The demand for breeding bulls in the district is on the increase and is now beyond our supply powers both for bulls bred on farms and for purchase-bulls.

Great difficulty is being experienced to obtain bulls bred in "A" breeding zone for placing out in "B". It is the common practice of breeders in this Presidency to sell off bull calves the minute they are weaned. The reason for this is that once a male calf leaves its mother, it becomes difficult and expensive to control and hence is sold the minute it is possible to do so. To overcome this difficulty an experiment is being tried this year by purchasing 7 bull calves when weaned and which will be reared at Chharodi Farm. We are experiencing great difficulty in rearing a large number of bull calves together. Being herded together, they are picking up vices, which are interfering with their growth and which later make them slow at service.

Another serious defect noticed on all farms is the increase in length of sheath, which hampers the bull in performing its duty. It was thought at one time that the character was correlated with milk but the defect is noticeable in the purely draught breeds. At present it is presumed that the defect is due to the above herding together of males, which by continual jumping on one another has brought out the defect.

Premium bulls.—During the year owing to financial stringency and to make the funds provided for the purpose to go as far as possible, it has been necessary to curtail the concession given. The method adopted now is either to help in purchase price and concession help from farms or to give only maintenance charge to those purchasing their own bull. Thus the inducements have been curtailed by 50 per cent. In some districts notably the Sholapur District the people are now not so willing to take bulls. The demand even on these curtailed conditions far exceeds

the supply. The statement below gives the position of Premium bulls in all zones showing increase and decrease :—

Zone	No. of bulls working on 1st July 1929	No. of bulls whose period expired during the year	No. of bulls put out during the year	No. of bulls on hand on 1st July 1930
<i>Intensive Breeding Zones</i>				
Chharodi	27	9	6	24
Surat	6	2	....	4
Satpura	3	....	3	6
Sholapur	9	9	....	....
Belgaum	3	2	....	1
Bankapur	10	1	1	10
<i>The rest of the Presidency.</i>				
S. C. D.	1	1	....	....
N. C. D.	14	4	1	11
S. D.	2	....	....	2
Gujarat	15	5	....	10
Konkan	6	....	....	6
Sind	3	1	1	3
Grand Total ..	99	34	12	77

N.B.—The Intensive Breeding zones are those in which the better cattle are found and where breeding is conducted by professional breeders. These are supplied with "A" class bulls.

The rest of the Presidency includes those areas in which a poorer type of animal is found.

"A" class bulls are bred on Government farms or specially selected and purchased. "B" class bulls are procured from the progeny of the better bulls and cows in the Intensive Breeding Zones and put out in the rest of the Presidency.

The Premium bulls in all cases without exception have made wonderful improvement and the scheme is now very popular.

All Co-operative Cattle Breeding Societies were visited by the Live Stock Expert personally, and by his district staff. These are all making fair progress with the exception of the Karur and the Alur Societies. The latter is taking no interest in its affairs and should be wound up. Reports have been submitted to the Registrar.

Palghar Infants and Public Milk Supply Co. Ltd. was inspected and a report submitted to Government.

Sheep breeding.—No progress was made in sheep improvement during the year. The progeny of rams put out in previous years are a distinct improvement. It has been decided that efforts be made to breed rams locally. Arrangements have been made with the Sangli Industrial and Agricultural School to make a start in a small way to breed cross bred Merino rams. Progress of the scheme will be reported next year.

Poultry.—Poultry keeping is on the increase and the improved Cock in great demand. At Rahuri in Ahmednagar District, Tallur and Saundatti in Belgaum District and Annigeri in Dharwar District private persons have small flocks, which are doing well. Bijapur District reports great progress with the Leghorn Cocks supplied by this Department.

General.—The Managers, Chharodi and Bankapur have worked very well during the year.

The three Divisional Inspectors have done very well especially so as they are not provided with peons.

My Office staff have carried out their duties to my satisfaction, especially so Mr. Phadke, my touring clerk.

Northcote Cattle Farm, Chharodi

Charge.—Mr. M. M. Desai, B.Ag., the permanent Manager acted as Assistant Professor of Animal Husbandry and Dairying and Manager, Agricultural College Dairy, Kirkee, from 17th April 1929 to 22nd December 1929, during which period Mr. D. S. Patel, L.Ag., Divisional Inspector, Northern Division, acted for him. Mr. B. G. Oka, B.Ag., acted as Assistant Manager from 16th April to 18th July 1929 until relieved by Mr. B. B. Jamsajina, B.Ag., who performed this duty for the remainder of the year.

Season.—The season as a whole was good although sowing had to be delayed. The rains ceased in August whereas usually they go well in September. Although there was a decrease of 17·97 cents of rain as compared with the previous rain, the number of rainy days was only short by two days.

Hay-making.—The smaller rainfall plus the more even distribution helped considerably the grass growth, there being no stagnation of water as in previous years. Thus a better hay crop was obtained and earlier and better grazing for the cattle, which responded with better milk yields.

During the year an area of 700 acres about was leased out for grazing at Rs. 1,800 for the season. Some 538,849 lbs. of hay were made during the year. The hay-making operations started on the 28th October 1929 and cutting was completed by the 30th November 1929; after being cured it was carted and stacked by the 15th January 1930. Hay-making by machinery has progressed considerably, the price of cutting, carting and stacking has been reduced from Rs. 4-9-5 in 1922-23 to Rs. 2-0-3 per 1,000 lbs.

Ensilage.—Silage making was started on 14th August 1929 and completed on 23rd September 1929. During this time 363,206 lbs. of silage was made from green grass, Jowar and Maize.

Fodder Crops (Kharif).—During the year local Jowar, Sundhia Jowar, Bajri and Maize were grown as main Kharif fodder crops. Pulses were once again given a trial. The season as stated before was a fair season although good for grass growth and grazing was not a good fodder crop year. It has been ascertained from experiments and experience.

To obtain good crops, sowing must take place early; this was not possible in the year under report. Similarly the early cessation of rains in August did not help matters.

The following are the yields per acre of the crop grown :—

Jowar green	..	17,345 lbs. per acre.
Maize green	..	9,720 lbs. per acre.
Guar green	..	2,530 lbs. per acre.
Elephant grass	..	44,604 lbs. per acre.
Oats	..	17,000 lbs. per acre.
Berseem	..	36,673 lbs. per acre.
Pulses—		
Udid	..	4,640 lbs. per acre.
Mug	..	4,890 lbs. per acre.
Chavli	..	6,120 lbs. per acre.
Tur	..	4,160 lbs. per acre.
Math	..	2,045 lbs. per acre.
Bajri (dry)	..	2,853 lbs. per acre (Kadbi).
Jowar (dry)	..	7,363 lbs. per acre (Kadbi).

The following conclusions are drawn from experience gained :—

- (1) That local Jowar is best suited to the tract.
- (2) That Sundhia Jowar must be sown early otherwise it will not yield well.
- (3) That Maize is a good crop to grow and is not so badly affected if sown late.
- (4) That Bajri cannot compare with Jowar from an economic point of view.
- (5) That Pulses do not do well with the exception of Chavli.
- (6) That to succeed with fodder crop in this area early sowing must be enforced.

During the year locusts made an appearance on the farm, and although doing great damage to neighbours, practically no damage was done on the farm.

Irrigated fodder crops.—Elephant grass grown on 1 acre and 15 gunthas yielded at an average of 44,605 lbs. per acre. This crop has been standing five years.

Peas and Oats sown on two plots—one of 28 gunthas and the other 27 gunthas yielded at the rate of 17,000 lbs. per acre. The sowings were made in October and late December, the earlier sown plots giving better results than that the later sown crop.

Berseem (Egyptian Clover). For the first time Berseem was sown on a 23 guntha plot; from this area in three cuttings 36,673 lbs. of green fodder was obtained and cost Rs. 403-8-7 per acre for irrigation, tillage and watching. The Berseem was relished by the cattle and helped stimulate the milk flow. It will be given a further trial on a larger scale next year.

Livestock.—Progress in improving.

During the year the herd yielded 142,680 lbs. of milk as against 115,344 lbs. during the year previous, although the number of animals actually milked drop by 20 this year, only 74 animals being milking as against 94 the year previous.

The reasons for the increase are :—

- (i) Rigid casting the year previous.
- (ii) A number of heifers calving for the first time and yielding well.
- (iii) The good grazing and no trouble from mosquito, etc., usually experienced in other years.

The milking qualities are distinctly on the increase this year.

The average per animal reaches 2,044 lbs. 8 ozs. as against 1,456 lbs. the year previous.

The number of animals yielding over 1,500 lbs. has been steady progress, reaching now 41 per cent. of the herd as against 31 per cent. the year previous. During the year 16 animals completing their lactation yielded over 3,000 lbs. of milk as given below :—

Serial No.	Name	Yield in lbs.	No. of days in milk	Remarks
1	Meghan of 1923	7,222	352	Calf suckling.
2	Medhi of 1924	4,587	365	Do.
3	Venar of 1918	4,365	339	Do.
4	Kachari of 1920	4,267	302	Do.
5	Patoli of 1923	4,161	305	Do.
6	Bhati of 1923	4,127	311	Do.
7	Vijli of 1923	3,825	233	Do.
8	Lili of 1919	3,756	317	Do.
9	Selar of 1921	3,594	266	Do.
10	Ravti of 1921	3,525	180	Do.
11	Nasal of 1924	3,349	364	Do.
12	Padol of 1923	3,304	217	Do.
13	Bhuri of 1924	3,302	240	Do.
14	Chokhli of 1925	3,287	301	Without calf.
15	Badam of 1924	3,277	287	Do.
16	Padol of 1925	3,098	312	Do.

All necessary precaution in our breeding programme is being watched carefully, such as prepotency of bull, our milk yield, etc.

Early maturity.—Twenty-one animals dropped their first calves at 3 years and 11 months as against 4 years and 4 months the year previous. The comparative statements of capacity of bulls is being maintained and watched carefully.

Casualty.—During the year 10 casualties were reported as against 11 the year previous. Foot and Mouth disease appeared on the farm on 10th January 1930. The whole herd was mixed and the diseased passed off quickly with no bad results.

Births.—During the year 38 male and 31 female calves were born, although the number is less than the previous year, the percentage of calving is better as we were dealing with a less number of animals.

Sales.—During the year some 50 animals were sold at an average price of Rs. 54-2-0 each as against an average price of Rs. 40-15-8 realized the year previous, although in the year previous a missionary helped to keep prices up.

Premium bulls.—Eight bulls were given out on the Premium System during the year.

Breeding herd.—Strength of the herd during the year stood as given below :—

Stud bulls	..	..	..	..	4
Cows	..	..	..	..	89
Heifers	..	..	..	..	65
Young bulls	..	..	..	..	53
Bullocks	..	..	..	..	41
Cow-calves	..	..	..	..	35
Bull-calves	..	..	..	..	45
Buffalo-bullock	..	..	..	..	1

Total ... 333

General.—Many visitors were received on the farm, principal among these being the Chief Saheb of Jasdan, the Thakore Saheb of Sanand, the Collector and the Assistant Collector of Ahmedabad, the Chief Veterinarian to the Government of Formosa and students from Bangalore and Vernacular Agricultural Schools.

A fire broke out during the year, which did more good than damage.

Feeding experiments conducted have been reported elsewhere.

Cattle Breeding Farm, Bankapur

Staff.—Mr. A. B. Gadagkar, G.B.V.C. the permanent Manager was on leave from 9th April 1929 to 8th December 1929, during his absence Mr. S. K. Angadi, G.B.V.C. and then Mr. B. G. Oka, B.Ag., acted.

Season.—As usual the season at Bankapur for farm purposes was normal.

Crops.—Cultivation at Bankapur is a difficult and tedious business. The farm site is an old fort artificially raised above the level of the adjoining land, consequently hundreds of tons of stone have had to be removed, drains and nullas filled in. The farm has now reached the maximum limit of land it can bring under cultivation, viz., 20 acres. This area was sown to Jowar, Maize and Soy Bean, the maximum yield being :—

Jowar (green)	..	..	20,400 lbs. per acre, unmanured.
Maize (green)	..	..	34,500 lbs. per acre manured.
Soy Bean	..	..	8,700 lbs. per acre.

The crops are grown for green fodder and for silage, which is fed in the summer. Lucerne has been grown on the farm without irrigation as a permanent crop for two years and has yielded in its two years at the rate of 19,000 lbs. per acre. The crop has died in patches and will be resown during the coming monsoon.

Ensilage.—The farm has 5 underground katcha pits; 414,712 lbs. of silage were made from the following crops:—

Jowar	.. 176,035 lbs. plus 9,060 lbs. fed green.
Maize	.. 156,373 lbs. plus 5,350 lbs. fed green.
Bajri	.. 50,736 lbs.
Grass (green)	.. 31,568 lbs.

The silage thus made was fed from January to the end of May; at this time a little green grazing is available, thus we are with the help of silage able to feed the cattle green fodder throughout the year.

Guinea grass.—A small plot in the bed of a disused tank was put down to Guinea grass and was grown as a dry crop, as there are no irrigation facilities on the farm. This plot yielded 1,235 lbs. in two cuttings. It lay dormant throughout the dry period and sprouted again when rains fell in May.

Pulses.—A few pulses were tried as a rotation crop with the principal fodder crops. Kulthi on 5 acres and 10 gunthas yielded 1,890 lbs. seed and 4,400 lbs. chaff.

Seed Jowar.—A plot measuring 4 acres was put down to Jowar for seed, this yielded 6,500 lbs. seed and 17,180 lbs. of dry kadbi. Some 5,350 lbs. of seed surplus to farm requirements was sold for Rs. 181-15-0.

Hay-making.—The farm has an area of 150 acres of grass land about 8 miles from the farm. Due to the fact that labour is expensive at the correct time to harvest hay, the farm is not able to start until December, which is on the late side. However with the help of moving machines, it is possible to complete all operations by the end of December. The total quantity of hay harvested is 107,020 lbs. at a cost of Rs. 271. The land also gives a couple of months of good grazing for the farm cattle.

Livestock.—The herd was kept in excellent condition throughout the year. The improvement of the herd is a slow process. The farm is breeding excellent female stock but the male stock are still disappointing, the main difficulty being in colour. The females are of uniform colour but the males are not. A new bull introduced a couple of years ago seems to be an improvement in this direction, and it is hoped that the present batch of young bulls will be an improvement on the former. Early maturity and regularity in calving is improving gradually. During the year 8 heifers were served at the age of 2 years and 6 months, one being served at 2 years and 1 month of age. This is a distinct improvement.

Milking.—Milking has been stopped and will be resumed when we can fix a better type.

Breeding herd.—The strength of the herd at the end of the year stands as given below :—

Breeding bulls	..	..	..	..	4
Cows	..	..	..	..	51
Young bulls	..	..	..	..	33
Heifers	..	..	..	..	29
Bullocks	..	..	..	..	9
Cow-calves	..	..	..	..	22
Bull-calves	..	..	..	..	21

Total .. 169

Premium bulls.—During the year the farm placed out 5 Premium bulls.

General.—During the year the farm supplied the Gokak farm and the Mohol farm each with a pair of bullocks.

Central Poultry Farm, Kirkee

Staff.—Mr. S. R. Zaidi, non-graduate assistant was in charge of this farm with the exception of 1 month and 10 days, during which period Mr. B. B. Jamaspjina, B.Ag., acted.

Farm.—The farm is located on a plot of 6 acres of land transferred from the Agricultural College Dairy and is located on the Bombay Road, Kirkee.

The farm has been provided with one Incubator Room, 8 double sided breeding pens, 2 miscellaneous pens, 4 chicken runs, the outer shell of 12 single testing pens and 2 single cockerel pens.

The farm is in need of more buildings, such as, flock pens for raising young stock on the free range principle, an Office, a godown and a working shed.

Strength of flock.—During the year one cock and 5 hens of the white Wyandotte breed were imported from England. These have done very well. One hen died having been trapped in its nest for too long during the very hot weather.

Statement attached (*vide* appendix I) shows the strength of the flock at end of the year.

Performance of flock is given in statement (*vide* appendix II).

Incubation.—The year under report was very unsatisfactory as far as incubation was concerned only 50 per cent. of eggs hatching; this may be due to several reasons, the most obvious being the inbreeding conducted on the farm in the past and the excessive heat prevailing at the time of incubation.

During the year 198 chicks died or were destroyed, this result is also very bad. Thirteen adult birds died during the year.

The farm came off very well as far as diseases are concerned. All over the Presidency a very virulent type of Pseudo pest (Ranikhet or New Castle disease) killed off many thousands of birds, especially so in Poona.

A great deal of work and research on poultry diseases is required before we can make any great headway with this industry.

Statement (*vide* appendix III) shows what advantage was taken of the farm. It will be seen that 10 cocks, 143 chickens and 153 setting of eggs were supplied to some 45 different persons and institutes plus 4,330 table eggs or a total realization of Rs. 918-15-3.

The industry has some promise but a good deal of spade work and investigation is necessary.

Teaching.—During the year 5 students were taught practical poultry farming.

**The Bombay Gowrakshak Mandali, Kandivlee*

The Government is still co-operating with this institute firstly as a demonstration to show what can be done with such institutes, and secondly to improve the Gir breed of cattle.

The results so far obtained as a demonstration have been very successful; nearly every Pinjrapole and Gowshala both in the Presidency proper and in Indian States have tried to copy the work done at Kandivlee.

Regarding the second point slow but sure progress is being made.

Breeding herd.—The strength of the herd during the year was :—

Bulls	2
Cows	34
Female-calves	51
Male-calves	42

Total .. 129

Some unprofitable poor yielding cows were transferred to the charitable section.

Five breeding bulls were sent out during the year.

Higher milk yield, regularity in calving and early maturity have all made an advance on the previous year.

E. J. BRUEN,

Live Stock Expert to Government, Bombay Presidency,
Poona.

APPENDIX

Statement showing the strength

Serial No.	Details	Flock at the beginning of the year	Increase during the year		
			Purchased		Hatched
			Birds	Chicks or eggs	Chicks
1	Ransford and Pensford White Leghorn (4 and above four years).	5	..	..	....
2	Ransford and Pensford White Leghorn (1 above two years and 5 yearlings).	6	..	..	....
			Imported.	Eggs Basra.	
3	Canadian White Leghorn (two years).	3	1	15	138
4	Dewar's and Mayo's White Leghorn (3 above two years and 4 yearlings).	7	..	..	....
5	Sheville, Christee and Australorp (3 above three years, 2 above two years and 9 yearlings).	14	..	..	Australorp. 60
6	Rhode Island Reds (1 yearling)	1	6	..	.....
			White Wyandotte		
7	White Leghorn cocks and cockerels (3 cocks and 2 cockerels).	5	..	..	R.I.R. 29
8	Sheville, Christee cocks and cockerels (1 cock and 2 cockerels).	3	..	..	Wyandotte. 11
9	White Leghorn chicks (5 months to a week old)	130	..	..	....
10	Australorp (5 months to a week old)	98	..	..	Basra. 9
11	Rhode Island Red (2½ months to a week old)	8	..	..	....
	Total	230	7	15	277

I

of flock as stood during the year

Decrease during the year						Flock at the close of the year
Sale		Deaths				
Birds	Chicks	Birds		Chickens		
		Died	Destroyed	Died	Destroyed	
..	..	..	..	..	..	<i>Birds.</i>
..	..	..	..	..	..	2 Years Ransford (Hens). 2
..	..	..	..	..	..	2 Years Pensford (Hens). 1
..	..	..	..	..	..	3 Years Dewar's .. 2
..	..	..	..	..	..	2 Years Dewar's .. 4
..	..	..	..	..	..	3 Years Canadian .. 3
..	..	..	..	..	..	2 Years Sheville .. 2
..	..	9	4	84	114	2 Years Christee .. 5
9	144	..	..	..	..	2 Years R. I. Red .. 1
						<i>Yearling.</i>
						Ransford and Pensford (Pullets). 12
						Prince of Wales' do. 8
						Canadian do. 6
						Wyandottes do. 5
						Sheville, Christee do. 15
						R. I. R. do. 3
						Cockerels (White Leghorn, Wyandotte, Australorp & R. I. R.) 11
						<i>Chicks.</i>
						White Leghorn, Austra- 120
						lorp.
						R. I. R., Wyandotte and 200
						Basra.
9	144	9	4	84	114	

E. J. BRUEN,

Live Stock Expert to Government, Bombay Presidency,
Poona.

APPENDIX II

*Statement showing the performance record of the Central Poultry Farm,
Kirkee*

Name of breed	Age or season	No. of birds (laying)	No. of testing days	Eggs laid	Yield per year	Remarks
Canadian White Leghorn	3rd season.	3	365	303	101	
Australorp (Christee)	Do. ..	1	270	78	78	
White Leghorn (Ransford and Pensford).	2nd season.	5	365	600	120	
White Leghorn (Ransford and Pensford).	1st season ..	18	270	1,945	145	
Australorp (Christee and Sheville).	Do. ..	12	270	1,010	112	
Rhode Island Reds	Do. ..	3	182	73	48	
White Wyandottes	Do. ..	5	75	143	148	

E. J. BRUEN,

Live Stock Expert to Government, Bombay Presidency,
Poona.

APPENDIX III

Central Poultry Farm, Kirkee

Serial Number	Name of Government Institution	No. of birds or chicks supplied	No. of public bodies	No. of birds or chicks supplied	Serial Number	Name of Government Station	No. of setting eggs supplied	No. of public bodies	No. of setting eggs supplied	Remarks
1	Wilson Anti-Famine Institute, Bijapur.	8 (Cockereils) W. L.	30	143	1	District Agricultural Overseer, North-Kanara (Konkan).	15	15	153	W. L. : White Leghorn A : Australorp.
2	Agricultural Rural School, Narayangaon. (District Poona).	2 (Cocks) W. L. & A.	..	..	..	....	..	..	..	
	Total ..	10	30	143	..	....	15	15	153	

E. J. BRUEN,

Live Stock Expert to Government, Bombay Presidency,
Poona.

APPENDIX P

SUMMARY OF WORK DONE UNDER THE AGRICULTURAL ENGINEER
TO GOVERNMENT, BOMBAY, POONA, FOR THE YEAR 1929-30

I held charge of the post of the Agricultural Engineer to Bombay Government for the whole year under report.

The question of reorganising the boring Department is still undecided and the result is that the work has suffered to a considerable extent and this was anticipated. The number of enquiries have fallen off, consequently a good number of machines remained idle and the result is that the operations were found to be expensive.

The valuation of all stock and tools and plant which we possess in the Presidency and Sind is an addition to our general activities. This work took over 3 months to finish even when employing all the possible staff. The cost of all stock we held on 31st March 1929 amounted to Rs. 5,57,083 including cost of the Fodder Baling and Bruising Plant at Karajyi, the Steam Ploughing tackle in Dharwar District, the Nangaon Plant in Poona District on river Bhima, the 7 Famine Pumping sets, the 56 Boring Machines in the custody of this office and the machines on the Experimental Well and in the Workshops and all our machines in Sind.

Advice and Inspection

There was a general increase in the number of technical enquiries, as they amounted to 167 this year against 138 of last year. Out of these 61 were for pumping, 6 for cane-crushing, 54 for boring, 9 for tractor ploughing, 1 for ginning, 4 for chaff-cutting and 22 for advice on general matters. There were 59 applications for admission to the Oil Engine Class out of whom 23 received the necessary training.

More attention could be given this year to the periodical inspection of machinery in the various divisions and the impression formed on inspection of machinery at 82 places revealed the fact that it is absolutely necessary to give constant supervision. Several machines have come to the end of their usefulness, others have become obsolete and the time has arrived to overhaul the whole position and effect certain changes so as to conform to the latest developments in machinery and keep pace with modern methods and design.

Estimates

Seven estimates for machinery, 6 for pumping and 1 for Tractor ploughing were supplied after inspection of the sites and 2 of them were granted Tagai loans by Government. The total number of sites inspected amounts to 15, out of which the one at Utran on River Girna in East Khandesh and one at Gangavara on River Godavari in Nasik District are worthy of mention, as they involved a Dumpy level detailed survey of the whole area. The pumping scheme at Utran is intended for an area of 120 acres under fruit cultivation for a private owner and the preparation of estimates is at present in progress. The first proposal was

to work 4 Centrifugal pumps in the area by electricity from a central generating station but this was afterwards modified to the working of 2 main pumps on the river bank and 2 high level pumps by electricity generated from a suitable generator at the plant to be fixed on the bank of the river. The scheme was further modified and now we propose one high class steam driven single plant of suitable size which will command the whole area and use the old existing plants as a stand by.

Drawings

The drawing office has turned out 111 drawings during the year under report.

Research and Experimental Work

Seed Drill.—The modified improved seed drill has been granted a Patent from the Patent Office, Calcutta, as a new invention. As decided by the Crop Research Committee of 1929 four drills were made at the Workshop and sent out for trial in the districts, but owing to the unfavourable monsoon the Director of Agriculture considered the test should not be used as a comparison. The general opinion was that it was too heavy for one pair of bullocks and required substantial reduction in weight. With the exception of this minor defect it was found that the drill sows evenly with any seed rate from 3 to 80 lbs. per acre and to any spacing and covers the seed simultaneously. The question of reduction in weight originally left to the manufacturers was afterwards given careful consideration. Consequently a modified design was worked out in association with Khan Bahadur Cooper of Satara, the Proprietor of the Cooper Engineering Works who are undertaking to manufacture a consignment of the drill. This is the first attempt ever made to manufacture and all Indian drill to sow any seed at any spacing and any quantity from 3 to 80 lbs. per acre as already stated.

The price of the drill is expected to be only Rs. 60 against Rs. 100 for the lowest priced imported drill. No imported drill has ever been found suitable for all Indian conditions and this is an effort to meet that very important requirement.

The previous model was practically all wood, but the latest model of modified design is being manufactured in all steel, which will prove to be a machine that will last a life-time. The salient features or principle of the old one being in tact, the new machine will be given exhaustive trials in the next Rabi season. The new model possesses all the merits of the old one but has in addition two improvements, viz., the coulters can be lifted at the head-lands and the sowing at the same time can be put out of operation by a single clutch. This drill now being suitable for all Indian conditions it will be found suitable also for all tropical agricultural condition apart from India.

Harrow.—In accordance with the recommendations of the Crop Research Committee the Broach Harrow was fitted with a convex blade and it will be tried by Professor Gokhale this year.

Winnower.—The modifications to the Winnower have been completed and the machine has now been made efficient for dealing with wheat

and oats in addition to jowar and bajri. This machine has also been handed over to the Cooper Engineering Works who are undertaking to manufacture a consignment of the machines.

The price has been reduced from Rs. 350 to Rs. 195 and should prove an attractive proposition.

The certified trial which took place at my Workshop showed that the Winnower will produce clean grain at a cost of Re. 0-5-0 per 1,000 lbs. against Re. 0-15-0 of the College Winnower.

Water Recorder.—The Cippoletti Weir at Manjri Farm was in need of an improved recording device which could accurately read to $\frac{1}{400}$ part of a foot, also in cusecs and gallons per minute simultaneously. This new arrangement has been made and fixed on the Weir with a pointer and a semicircular dial which is divided in 200 equal parts. By this apparatus the rise or fall in the water level over the crest of the Weir by $\frac{1}{400}$ part of a foot can be detected by the pointer and read in feet cusecs, and gallons simultaneously.

The Monotrac.—Further experiments with the Monotrac confirmed the view expressed in my previous report that the machine is only useful for interculture and secondary light operations. It is not useful for ploughing operations unless it is in already cultivated lands and even then to a shallow depth. The machine has been returned to the makers as it was obtained on loan and the firm write to say a new model has been put on the market.

The Howard's Potato Digger.—This machine was tried at the College Farm with the result that it was found to be too heavy for an ordinary sized pair of bullocks. Moreover, the general arrangement was based on English conditions and entirely different to what is generally used in this country. The whole thing requires modification and adopted to Indian conditions. It will take some time to produce a satisfactory model.

Plough Tests.—Exhaustive experiments both intensive and extensive with the Ransome C.T.2 plough and the Bahadur No. 2 plough made by the Cooper Engineering Works, Satara, are in progress at the College Farm jointly by the Professor of Agriculture and the Agricultural Engineer and the results will be published later when the tests are completed.

The Soil Sampling Machine.—In connection with the Sukkur Barrage Scheme, the P. W. D. authorities had difficulty in collecting soil samples of 20 to 30 feet from the surface in correct sequence to determine sand bars and clay bars. This Department was therefore approached to devise a machine which could take out soil samples and deal with all prevailing strata in Sind, viz., clay, loam, sand, and rock and at the same time do the work quickly. Hence a portable machine for easy transport was made. More than 8 months were spent in experiment and test with different models of machines and with various types of tools until a satisfactory design could be evolved and its performance approved by the P. W. D. authorities on actual inspection at Poona. The approved model was sent to Sind for exhaustive tests under Sind conditions where

it proved to be quite successful, quick and capable of dealing with any kind of strata by the use of the special tools to the depth specified. The approved model is mounted on a four-wheeled trolley and consists of a swing derrick mounted on two uprights fixed to the frame with a winch at the back for hoisting or lowering tools. A sliding hand-power head for working rotary tools is also fixed on the frame to bore in rock whenever necessary. The soil tools which consists of an earth auger, a ribbon auger, and a sludger can be worked from the derrick direct and the rock tools through a rotary gear head. The chief features of the approved machine are portability, quickness in operation and handling of any strata including sand dunes, running sand, clay and rock. A special feature of the swing derrick is that it can be raised or lowered by a few turns of the winch when operated by two men. On actual trial of the machine the P. W. D. authorities expressed their satisfaction with its general working. But they discovered that a portable machine could not be taken through ravines and very rough country. Consequently the camel is the only source of transport. They have, therefore, requested this office to dispense with the trolley and lighten the machine in such a way without interfering with its general design, so that it can be carried from place to place on camels. Accordingly plans for revised model have been worked out and sent to Sind for further experiments. Although this work took considerable time and energy and absorbed the attention of the superior staff for months on end, the satisfactory solution of the problem in the evolution of the right type of design has more than repaid all the trouble taken in the case. This principle of drilling is not only suitable for soil sampling but will be found eminently suitable for all kinds of well-boring machines, in place of the present cumbersome fixed derrick machines, and should meet with the appreciation of any one interested in well-boring on account of its portability.

This is the first machine of its kind with the collapsing or folding derrick which has ever been manufactured.

Executive Work

In addition to the great amount of work involved and actually executed in connection with experiments and research the Department has done a lot in other respects such as boring, the erection of a Pumping Plant at the Ganeshkhind Botanical Gardens, Kirkee, the erection of Poultry Pens and Runs at the Government Poultry Farm, repair work at the College Dairy, repairs to the pumping plant on the Septic tank at the Agricultural College, Poona, and the hiring out of pumping plants, are some of the important works executed this year.

Boring

As previously stated the inquiries for actual work have reduced considerably due to want of necessary publicity, adequate canvassing and change in the existing rules. The receipts have naturally fallen and operations have become more expensive. The charge on boring for supervision, repairs, renewals and Mechanics' wages and travelling allowance has increased on account of irregular work for the full working

period during the year. Moreover, despatching machines indiscriminately for stray works interferes with progress and lowers footage. All my work is provided by the Revenue Department and no canvassing is done. It might be possible to get plenty of boring if men were sent out to explain to the cultivators the advantages of boring and get orders. In the case of regular work with minimum amount of shiftings, 7,500 feet could be bored with power machines and 8,550 feet with hand machines against the total of 1,927 feet by power and 2,283 feet by hand. Subsequently the cost to Government would be reduced to Rs. 3-13-5 per foot in case of power machines and Rs. 1-12-6 per foot in case of hand machines instead of Rs. 12-6-0 and 7-4-1 respectively. Amalgamation of all the boring activities under one Technical head and a little simplification of rules appear to be the only solution to bring about a satisfactory result both in point of output and economy and it is earnestly requested that attempts be made to meet the situation on the above lines.

During the year 29 machines were at work, of which 10 were power and 19 hand. The total footage made amounts to 4,210 feet and 2 inches and the number of gallons tapped 21,881. The percentage of successful bores is 74.2. The total receipts amount to Rs. 4,368-9-9. A schedule giving further details is attached.

Out of the successful bores the one made in the well of the Secretariat compound at Mahableshwar needs special mention. The Water Diviner to Government had examined the site and declared it to be useless as regards any water supply and hence the boring work was stopped in 1929. The work however recommenced this year simply because I felt convinced water could be had so the bore was taken to a depth of 105 feet from the surface in March 1930, when a strong current of water was tapped at the junction of the laterite and traplayers and the water rose 36 feet.

The water tapped was then tested with a Myer's hand pump which was worked continuously for eight hours in the hottest part of the year when most of the wells dry up and 1,800 gallons were delivered without much depression in the water level. The capacity of the pump is 240 gallons per hour and it was worked by the members of the Secretariat compound and adjoining bungalows and about 1,500 gallons were pumped every day for drinking purpose. This will give some idea of the advantages of boring machines and tube wells and ought to serve as an instance to interprising well owners to augment their water supply.

Pumping

A brief description of the pumping plant erected by my Department at the Ganeshkhind Gardens, Kirkee, will not be out of place as it presents certain special features which are very uncommon in ordinary installations. The plant is fixed on the bank of river Mula on a hollow plinth raised 6 feet above ground level in order to keep it clear of high floods. The pump is shrouded on all sides and the machinery foundations are kept entirely separate from the foundations of the raised plinth and the shrouding walls in order to avoid any damage due to sinkage. The

foundations are taken 7 feet below the surface 3 feet of which are in murrum, 2 feet in lime concrete and 2 feet in reinforced concrete. The engine house floorlevel is reached by reinforced concrete steps and there is a wooden staircase provided to reach the pump and also to the hollow plinth which is to be utilised as a store room for the plant. The engine is 21 B.H.P. Blackstone Spring Injection cold start provided with a self starter. The pump is a 4" Ruston Belt Driven Centrifugal pump. The suction and delivery pipes which are 6" in diameter are 70' and 620' in length respectively. The delivery of the pump which is 400 gallons per minute is discharged into an elevated tank fixed on a steel tower from which water gravitates into the main channel in the guava plot to a distance of about 1,250' in 9" R.C. Hume pipes and to the 16 B plot across a Nala to a distance of 1,150 feet in 4" W.I. main. The main delivery is provided with a vent tank at 1,200 feet to relieve the pressure in the pipes. This plant is capable of irrigating 40 acres of land under garden cultivation and the cost of water per acre per annum is expected to be about Rs. 63 exclusive of interest and depreciation. It will be interesting to know that all the steel frame work was made at the Workshops and the whole erection carried out by my men.

This year three pumping plants were given on hire which realised Rs. 936-9-9.

A new power spraying machine purchased by the Deputy Director of Agriculture, Konkan Division, for the use in the Cardamom gardens round about Sirsi was tested at the Workshops and was made portable to cart the plant from place to place in Sirsi Taluka, District Karwar.

General

This year we had the advantage of a visit to the Workshops and Experimental Well by the Hon'ble the Minister of Agriculture who expressed general satisfaction with work done.

I was on tour in Sind this year for inspection of machinery, for arranging work at Sakrand and for running the tests of the Soil Sampling Machine at Sukkur under actual conditions.

I had also an opportunity of going to Simla to attend the Advisory Board to the Imperial Council of Research to discuss matters on mechanical cultivation.

Arrangements were made for a Tractor demonstration this year in association with Messrs. William Jacks & Co. of Bombay with two of their new model Caterpillar Tractors 15 and 30. The test was made on the Poona-Satara Road.

Total receipts of the Department including pumping, boring, etc. amount to Rs. 5,621-15-3.

I have to express my great appreciation of strenuous work done by my staff.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona

STATEMENT

Agricultural Engineer's Department.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of the bore
1	2	3	4	5	6	7
Dharwar District						
1	Mr. M. V. Patil ..	Gaoth a n bore.	Bon ..	Holemannur ..	Surface bore ..	3'
2	Mr. N. D. Kulkarni ..	Do. ..	Do. ..	Holeatur ..	Do. ..	3'
3	Mr. V. S. Alwandi ..	Do. ..	Do. ..	Do. ..	Do. ..	3'
4	Mr. B. C. Advaninath ..	Do. ..	Shiggaon ..	Bankapur ..	Pit 12' x 18' x 10'.	3'
5	Taluka Local Board, Shiggaon.	Gaoth a n well.	Do. ..	Bisanhalli ..	Well bore 66' x 12' x 12'.	3'
6	Mr. M. N. Nadab ..	Do. ..	Do. ..	Melchalli ..	Well bore 65' x 16' x 16'.	3'
7	Mr. C. Akkalkoti ..	Do. ..	Do. ..	Bankapur ..	Well bore 35' x 6' x 5'.	3'
8	Mr. B. B. Patil ..	Do. ..	Hirekerur ..	Katankeri ..	Well bore 40' x 12' x 12'.	3'
9	Mr. G. C. Vaish ..	Do. ..	Do. ..	Hirekerur ..	Well bore 26' x 4' x 4'.	3'
10	President, Taluka Local Board, Hirekerur.	Do. ..	Do. ..	Kachavi ..	Well bore ..	3'
11	Mr. S. M. Naik ..	Do. ..	Ranebennur ..	Ranebennur.	Well bore 20' x 10' x 10'.	3'
12	President, Ranebennur Municipality.	Do. ..	Do. ..	Do. ..	Well bore 28' x 4 1/2'.	3'
13	Mr. B. E. Totadavaru ..	16	Do. ..	Tuminhalli ..	Well bore 19' x 21' x 21'.	3'
14	Mr. R. B. Karekatti ..	42	Do. ..	Do. ..	Well bore 34' x 33' x 26'.	3'
15	Mr. C. S. Katagi ..	41	Do. ..	Do. ..	Well bore 35' x 29' x 27'.	3'
16	Mr. Basavantappa Jangli ..	Gaoth a n well.	Do. ..	Tuminkatti ..	Well bore 40' x 10' x 10'.	3'
17	Mr. I. M. Patil ..	173	Do. ..	Gudga d hosalli.	Well bore 26' x 23' x 22'.	3'
18	Mr. B. K. Patil ..	35	Do. ..	Bannihatti ..	Well bore 50' x 15' x 15'.	3'
19	Assistant Engineer, Irrigation, Dharwar.	Rest House	Shiggaon ..	Lakkikop ..	Well bore ..	3'
20	Assistant Engineer, Irrigation, Haveri.	Do. ..	Hirekerur ..	Rattihalli ..	Well bore 36' x 6'.	3'
21	Do. do. ..	Do. ..	Do. ..	Do. ..	Well bore ..	3'
22	Do. do. ..	Do. ..	Hangal ..	Honkan ..	Well bore 53' x 6'.	3'
23	Mr. Bhimbhat Joshi ..	199	Haveri ..	Kanvalli ..	Well bore 60' x 50' x 50'.	3'

Boring Schedule for 1929-30

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, casing, cutting shoe, etc.	Departmental charges for the well owner called Flat charge	Average Departmental expenses on the bore including
							Supervision and Depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
02'	Nil.	240	240	40 0 0	126 0 0	68 0 0	60 6 2
55'	Nil.	240	240	50 0 0	15 0 0	57 8 0	53 9 1
74'	Nil.	240	240	75 0 0	20 0 0	86 0 0	72 1 2
5'-1"	Nil.	240	240	199 0 0	16 8 0	84 8 0	71 1 7
40'	Nil.	400	400	50 10 0	14 0 0	40 0 0	38 15 4
40'	Nil.	12	12	74 0 0	13 0 0	50 0 0	38 15 4
9'-6"	26	900	870	48 8 0	10 0 0	9 8 0	9 4 0
21'	54	374	320	48 8 0	11 10 0	21 0 0	20 7 3
40'	Nil.	240	240	58 8 6	1 10 0	40 0 0	38 15 4
22'-9"	..	..	..	....	....	....	....
17'	Nil.	800	800	74 6 0	6 0 0	17 0 0	16 8 11
65'-4"	Nil.	240	240	171 14 0	24 0 0	73 0 0	63 10 1
44'	20	1,440	1,420	81 0 0	5 0 0	44 0 0	42 13 8
40'	20	1,520	1,500	54 0 0	4 0 0	40 0 0	38 15 4
43'	Nil.	1,500	1,500	63 0 0	7 0 0	43 0 0	41 14 1
36'	..	..	..	....	....	....	....
50'	62	1,562	1,500	21 0 0	0 14 0	50 0 0	48 11 2
30'-6"	..	..	..	....	....	....	....
54'-5"	..	..	..	....	....	....	....
12'	..	..	..	....	....	....	....
69'	21	261	240	74 4 0	3 13 9	78 8 0	67 3 3
45'	13	253	240	103 12 0	3 6 0	45 0 0	43 13 3
22'-6"	375	1,875	1,500	108 0 0	5 0 0	56 0 0	21 14 8

Agricultural Engineer's Department.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Average Departmental expenses on the bore including
						Running expenses, mechanic's wages and repairs
1	2	3	4	5	6	16
<i>Dharwar District</i>						
						Rs. a. p.
1	Mr. M. V. Patil	Gaot h a n bore.	Ron	Holemannur	Surface bore..	389 7 0
2	Mr. N. D. Kulkarni	Do. ..	Do. ..	Holealur	Do. ..	345 7 6
3	Mr. V. S. Alwandi	Do. ..	Do. ..	Do. ..	Do. ..	404 13 0
4	Mr. B. C. Advaninath	Do. ..	Shiggaon	Bankapur..	Pit 12' x 18' x 16'.	458 8 6
5	Taluka Local Board, Shiggaon.	Gaot h a n well.	Do. ..	Bisanhalli..	Well bore 66' x 12' x 12'.	251 4 0
6	Mr. M. N. Nadab	Do. ..	Do. ..	Melchalli ..	Well bore 65' x 10' x 16'.	251 4 0
7	Mr. C. Akalkoti	Do. ..	Do. ..	Bankapur..	Well bore 85' x 5' x 5'.	60 0 9
8	Mr. B. B. Patil	Do. ..	Hirekerur ..	Katanker..	Well bore 40' x 12' x 12'.	131 14 6
9	Mr. G. C. Vajsb	Do. ..	Do. ..	Hirekerur ..	Well bore 26' x 4' x 4'.	251 4 0
10	President, Taluka Local Board, Hirekerur.	Do. ..	Do. ..	Kachavi ..	Well bore ..	....
11	Mr. S. M. Naik	Do. ..	Ranebennur	Rane b e n nur.	Well bore 60' x 10' x 10'.	107 12 6
12	President, Ranebennur Municipality.	Do. ..	Do. ..	Do. ..	Well bore 48' x 4'.	410 6 0
13	Mr. B. R. Totadavaru	16	Do. ..	Tuminhalli.	Well bore 19' x 21' x 21'.	276 6 0
14	Mr. R. B. Karekatti	42	Do. ..	Do. ..	Well bore 34' x 33' x 26'.	251 4 0
15	Mr. C. S. Katagi	41	Do. ..	Do. ..	Well bore 35' x 49' x 47'.	270 1 6
16	Mr. Basavantappa Jangli	Gaot h a n well.	Do. ..	Tuminkatti.	Well bore 40' x 10' x 10'.	....
17	Mr. I. M. Patil	178	Do. ..	G u d d a d hosalli.	Well bore 20' x 23' x 23'.	314 1 0
18	Mr. B. K. Patil	35	Do. ..	Bannihatti.	Well bore 50' x 15' x 15'.	....
19	Assistant Engineer, Irrigation, Dharwar.	Rest House	Shiggaon	Lakkikop ..	Well bore ..	....
20	Assistant Engineer, Irrigation, Haveri.	Do. ..	Hirekerur ..	Battihalli ..	Well bore 36' x 6'.	....
21	Do. do.	Do. ..	Do. ..	Do. ..	Well bore ..	433 6 6
22	Do. do.	Do. ..	Hangal	Honkan ..	Well bore 55' x 6'.	282 10 6
23	Mr. Bhimbhat Joshi	109	Haveri	Kanvalli ..	Well bore 60' x 50' x 50'.	339 3 0

Boring Schedule for 1929-30—contd.

Cost of bore to the well owner. Total of columns 12, 13 and 14	Cost per foot to the well owner	Grand Total cost of bore inclusive of well owner's and Department- al cost. Total of columns 15, 16 and 17	Grand Total cost per foot	Object of boring, i.e., agriculture or gardening or drinking	Remarks. i.e., successful, un- successful, incomplete, on hand, abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
234 0 0	3 12 4	683 13 2	11 0 5	Drinking ..	Successful.
122 8 0	2 3 8	521 8 7	9 7 8	Do. ..	Do.
181 0 0	2 7 0	617 14 2	8 5 7	Do. ..	Do.
300 0 0	4 1 9	829 10 1	11 5 10	Do. ..	Successful. Completed during this year. Last year's work 67 feet 11 inches.
104 10 0	2 9 10	394 13 4	9 13 11	Do. ..	Successful.
137 0 0	3 6 9	427 3 4	10 10 10	Do. ..	Unsuccessful.
77 0 0	8 2 0	146 4 9	15 6 5	Do. ..	Successful.
81 2 0	3 14 0	233 7 9	11 1 11	Do. ..	Do.
99 13 6	2 8 0	390 0 0	9 12 0	Do. ..	Do.
....	....	....	....	Do. ..	In progress.
97 6 0	5 11 9	221 11 5	13 0 8	Do. ..	Successful.
264 14 0	4 1 10	742 14 1	11 6 0	Do. ..	Do.
130 0 0	2 15 3	449 3 8	10 3 4	Agriculture ..	Do.
98 0 0	2 7 0	358 3 4	9 11 3	Do. ..	Do.
113 0 0	2 10 0	424 15 7	9 14 1	Do. ..	Do.
....	....	....	....	....	In progress.
71 14 0	1 7 0	434 10 2	8 11 0	Agriculture ..	Successful.
....	....	....	....	....	In progress.
....	....	....	....	....	Do.
....	....	....	....	....	Last year's 40 feet. Aban- doned for accident.
156 9 9	2 4 3	657 3 6	9 8 4	Drinking ..	Successful.
152 2 0	3 6 9	478 9 9	10 10 0	Do. ..	Do.
169 0 0	3 2 0	530 1 8	9 13 0	Agriculture	Successful. Completed this year. Last year's work 31 feet 6 inches.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of the bore
1	2	3	4	5	6	7
	<i>Dharwar District—contd.</i>					
24	Mr. C. L. Patil ..	126	Haveri ..	Kyalkond ..	Well bore 30' x 25' x 20'	3½"
25	Mr. L. B. Kalamdani ..	Gaothan well.	Do. ..	Haveri ..	Well bore ..	3½"
26	Mr. G. L. Koralhalli ..	Do.	Navalgund ..	Annegiri ..	Do.	6"
	<i>Bijapur District</i>					
27	Taluka Local Board, Badami.	Gaothan bore.	Badami ..	Mudkavi ..	Surface ..	3½"
28	Mr. C. S. Kalyanshetti ..	Do. ..	Do. ..	Badami ..	Do. ..	3½"
29	Mr. C. G. Pattan ..	Do. ..	Do. ..	Do. ..	Do. ..	3½"
30	Taluka Local Board, Sindgi	32	Sindgi ..	Allapur ..	Do. ..	3½"
31	Do. do. ..	2	Do. ..	Nagavi ..	Do. ..	3½"
32	Mr. Pannalal Jannadas ..	House No. 1392.	Badami ..	Guledgudda ..	Do. ..	3½"
33	Mr. Sankappa Basanhalli ..	House No. 2414.	Do. ..	Do. ..	Do. ..	3½"
34	Taluka Local Board, Badami.	1	Do. ..	Nagrai ..	Well bore 30' x 23'	3½"
35	Mr. N. Mulchand ..	87	Hungund ..	Amingad ..	Pit 10'	3½"
36	Mr. S. S. Garadi ..	433	Do. ..	Do. ..	Surface ..	3½"
37	Mr. S. B. Deshpande ..	Gaothan bore.	Do. ..	Hal ..	Do. ..	3½"
38	Mr. N. M. Marwadi ..	88	Do. ..	Amingad ..	Do. ..	3"
39	Anti-Famine Institute, Bijapur.	Institute compound.	Bijapur ..	Bijapur ..	Do. ..	3½"
40	Mr. Marigeyya Jaugin ..	Gaothan well.	Bagalkot ..	Bagalkot ..	Well bore 54' x 8'	6"
41	Mr. D. K. Kulkarni ..	Gaothan bore.	Do. ..	Bammanagi ..	Surface ..	6"
	<i>Sholapur District</i>					
42	Mr. P. G. Dhas ..	140	Barshi ..	Pimpalgaon.	Well bore ..	3"
43	Mr. D. M. Dhas ..	26	Do. ..	Do. ..	Well bore 29' x 14'	3½"
44	Mr. G. N. Ronge ..	52	Do. ..	Khadkal, gaon.	Well bore 38' x 21'	3½"
45	Mr. J. N. Kulkarni ..	Gaothan well.	Do. ..	Ambe-javalge.	Well bore 23' x 3½'	3½"

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, carting, casing, cutting shoe, etc.	Departmental charges for the well owner called Flat charge	Average Departmental expenses on the bore including Supervision and Depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
21'	188	1,688	1,500	32 0 0	22 0 0	21 0 0	20 7 3
35'	..	..	..	....	....	....	....
127'	..	..	..	....	....	....	....
39'	NH.	10	10	178 12 0	13 4 0	NH.	37 15 9
60'-2"	NH.	240	240	71 12 0	45 0 0	65 4 0	58 9 7
17'-10"	..	..	..	....	....	....	....
55'-6"	NH.	240	240	....	....	....	....
29'	NH.	240	240	....	....	....	....
30'	NH.	240	240	55 0 0	51 8 0	80 0 0	29 3 6
25'	NH.	..	..	....	....	....	....
32'-6"	NH.	240	240	74 7 0	23 4 0	32 8 0	31 10 5
92'-6"	NH.	240	240	54 11 0	98 7 0	113 12 0	90 1 6
84'-6"	NH.	240	240	138 4 0	82 0 0	101 12 0	82 4 10
8'	..	..	..	....	....	....	....
58'	NH.	240	240	86 10 0	80 0 0	62 0 0	56 7 10
46'	NH.	240	240	125 0 0	38 0 0	56 0 0	44 12 10
20'	NH.	240	240	45 3 0	23 9 0	20 0 0	50 15 0
50'	NH.	240	240	23 7 0	116 9 0	50 0 0	127 5 6
..	..	..	..				
35'	2,000	2,800	800	42 0 0	3 0 0	35 0 6	34 1 5
32'	NH.	NH.	NH.	42 0 0	5 0 0	50 0 0	31 2 8
35'	NH.	NH.	NH.	93 0 0	21 0 0	50 0 0	34 1 5

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Average Departmental expenses on the bore including
						Running expenses, mechanic's wages and repairs
2	3	4	5	6	16	
<i>Dharwar District—contd.</i>						Rs. a. p.
24	Mr. C. L. Patil ..	126	Haveri ..	Kyalkond ..	Well 30' x 25' x 20' bore	131 14 0
25	Mr. L. B. Kalamdani ..	Gaot h a n well.	Do. ..	Haveri ..	Well bore	....
26	Mr. G. L. Korahalli ..	Do. ..	Navalgund ..	Annegiri ..	Do. ..	....
<i>Bijapur District</i>						
27	Taluka Local Board, Badami.	Gaot h a n bore.	Badami ..	Mudkavi ..	Surface	244 15 6
28	Mr. C. S. Kalyanshetti	Do. ..	Do. ..	Badami ..	Do. ..	377 14 9
29	Mr. C. G. Pattan ..	Do. ..	Do. ..	Do. ..	Do. ..	....
30	Taluka Local Board, Sindgi	32	Sindgi ..	Athapur ..	Do. ..	....
31	Do. do. ..	2	Do. ..	Nagavi ..	Do. ..	....
32	Mr. Pannalal Jannadas ..	H o u s e No. 1392.	Badami ..	Guledgudda	Do. ..	439 11 0
33	Mr. Sankappa Basanahalli	H o u s e No. 2414.	Do. ..	Do. ..	Do. ..	....
34	Taluka Local Board, Badami.	1	Do. ..	Nagral ..	Well 30' x 28' bore	204 2 3
35	Mr. N. Mulchand ..	87	Hungund ..	Amingad ..	Pit 10'	581 0 3
36	Mr. S. S. Garadi ..	433	Do. ..	Do. ..	Surface	530 12 3
37	Mr. S. B. Deshpande ..	Gaot h a n bore.	Do. ..	Ilal ..	Do. ..	....
38	Mr. N. M. Marwadi ..	88	Do. ..	Amingad ..	Do. ..	364 5 0
39	Anti-Famine Institute, Bijapur.	Institu t e compound.	Bijapur ..	Bijapur ..	Do. ..	339 3 9
40	Mr. Marigeyya Jangin ..	Gaot h a n well.	Bagalkot ..	Bagalkot ..	Well 54' x 8' bore	196 9 0
41	Mr. D. K. Kulkarni ..	Gaot h a n bore.	Do. ..	Bammanagi.	Surface	491 6 6
<i>Sholapur District</i>						
42	Mr. P. G. Dhas ..	140	Barshi ..	Pimpalgaon	Well bore	....
43	Mr. D. M. Dhas ..	26	Do. ..	Do. ..	Well 29' x 14' bore	219 13 6
44	Mr. G. N. Ronge ..	52	Do. ..	Khadkalgaon.	Well 38' x 21' bore	201 0 6
45	Mr. J. N. Kulkarni ..	Gaot h a n well.	Do. ..	Ambejavalge.	Well 23' x 31' bore	219 13 6

Cost of bore to the well owner. Total of columns 12, 13 and 14	Cost per foot to the well owner	Grand Total cost of bore inclusive of well owner's and Departmental cost. Total of columns 15, 16 and 17	Grand Total cost per foot	Object of boring, i.e., agriculture or gardening or drinking	Remarks, i.e., successful, unsuccessful, incomplete, on hand, abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
75 0 0	3 0 0	227 5 9	10 13 0	Agriculture ..	Successful.
....	....	....	....	....	In progress.
....	....	....	....	....	Do.
192 0 0	2 14 4	474 15 3	7 2 5	Drinking ..	Unsuccessful. Completed this year. Last year's work 27 feet 4 inches.
182 0 0	3 0 6	618 8 4	10 4 5	Do. ..	Successful.
....	....	....	....	....	In progress.
....	....	....	....	....	Successful. Particulars regarding the bore not received from the Taluka Local Board to whom the machine was lent.
....	....	....	....	....	Do. do.
186 8 0	2 10 8	655 6 6	9 5 5	Drinking ..	Successful. Last year's work 40 feet.
....	....	....	....	....	Rejected on account of accident.
130 3 0	3 12 0	365 15 8	11 0 5	Drinking ..	Successful.
261 14 0	2 13 3	932 15 9	10 1 4	Do. ..	Do.
322 0 0	3 13 0	935 1 1	11 1 1	Do. ..	Do.
....	....	....	....	....	Rejected on account of boulders.
228 10 0	3 15 0	649 6 10	11 3 2	Drinking ..	Successful.
219 0 0	4 1 0	602 15 10	11 2 8	Do. ..	Successful. Completed this year. Last year's 8 feet.
88 12 0	3 7 0	336 4 0	16 13 0	Do. ..	Successful.
190 0 0	2 13 0	808 12 0	16 2 10	Do. ..	Do.
....	....	....	....	....	Bore left incomplete at 20 feet last year. Rejected at owner's request.
80 0 0	2 5 0	330 14 11	9 8 7	Agriculture ..	Successful.
97 0 0	3 0 6	329 2 8	10 4 7	Do. ..	Unsuccessful.
164 0 0	4 11 0	417 14 11	11 15 0	Drinking ..	Do.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of the bore
1	2	3	4	5	6	7
<i>Ahmednagar District</i>						
46	Taluka Local Board, Ahmednagar.	78	A h m e d-nagar.	Adhavwadi.	Well bore	6"
47	Do. do.	Gaoth a n well.	Do.	Nimbalk.	Well 31' x 15' bore	6"
48	Mr. N. R. Shedge	Do.	Kopargaon.	Belapur	Well 31' x 10' x 9' x 4' bore	6"
49	Mr. H. G. Girme	48	Do.	Do.	Well bore	6"
50	President, Vadala Mission, Vadala.	Mission compound.	Newasa	Vadala	Well 52' x 15' bore	31"
<i>Satara District</i>						
51	Executive Engineer, Public Works Department.	Secretariat Building compound.	Jawali	Mahabaleshwar.	Well 61' x 4' x 6' bore	4"
<i>Kolaba District</i>						
52	Mr. Alisab Mahmood	Not known.	Mangaon	Morba	Surface	6"
<i>Nasik District</i>						
53	Mr. D. Savaiam	Gaoth a n bore.	Niphad	Sayakheda	Surface	31"
54	Mr. J. R. Marwadi	Do.	Do.	Do.	Do.	31"
55	Mr. N. S. Dani	Do.	Do.	Do.	Do.	31"
56	Mr. D. Savaiam	Do.	Do.	Do.	Do.	31"
57	Do.	Do.	Do.	Kherwadi.	Do.	31"
58	Mr. R. D. Kulkarni	Do.	Nandgaon	Nyaya-dongri.	Do.	6"
<i>Surat District</i>						
59	Taluka Local Board, Bardoli.	Gaoth a n well.	Bardoli	Valod	Well 36' x 5' x 6' bore	6"
60	Mr. K. Vallabhadas	Do.	Do.	Do.	Well 44' x 4' bore	6"
61	Taluka Local Board, Bardoli.	Do.	Do.	Do.	Well 40' x 6' bore	6"
62	Do. do.	Do.	Do.	Do.	Well 30' x 5' bore	6"
<i>Panch Mahals District</i>						
63	Taluka Local Board, Godhra.	Gaoth a n well.	Godhra	Tuwa	Well bore	6"

[illegible]

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Average Departmental expenses on the bore including Running expenses, mechanic's wages and repairs
1	2	3	4	5	6	16
<i>Ahmednagar District</i>						Rs. a. p.
46	Taluka Local Board, Ahmednagar.	78	A h m e d nagar.	Adhavwadi	Well bore ..	...
47	Do. do.	Gaoth a n well.	Do.	Nimblak	Well bore 31' x 15'.	1,769 1 0
48	Mr. N. R. Shedge	Do.	Kopargaon	Belapur	Well bore 31' 10" x 9' x 4'.	1,764 2 4
49	Mr. H. G. Girme	48	Do.	Do.	Well bore ..	..
50	President, Vadala Mission, Vadala.	Mission compound.	Newasa	Vadala	Well bore 52' x 13'.	109 9 6
<i>Salara District</i>						
51	Executive Engineer, Public Works Department.	Secretariat Building compound.	Jawli	Mahabaleshwar.	Well bore 61' 4" x 6'.	585 9 5
<i>Kolaba District</i>						
52	Mr. Alisab Mahmood	Not known.	Mangaon	Morba	Surface ..	..
<i>Nasik District</i>						
53	Mr. D. Savairam	Gaoth a n bore.	Niphad	Sayakheda	Surface ..	314 1 0
54	Mr. J. R. Marwadi	Do.	Do.	Do.	Do.	163 1 0
55	Mr. N. S. Dani	Do.	Do.	Do.	Do.	452 4 0
56	Mr. D. Savairam	Do.	Do.	Do.	Do.	100 8 0
57	Do.	Do.	Do.	Kherwadi	Do.	..
58	Mr. R. D. Kulkarni	Do.	Nandgaon	Nyaya-dongri.	Do.	..
<i>Surat District</i>						
59	Taluka Local Board, Bardoli.	Gaoth a n well.	Bardoli	Valod	Well bore 36' x 5' 6".	343 15 9
60	Mr. K. Vallabhdas	Do.	Do.	Do.	Well bore 44' x 4'.	629 0 0
61	Taluka Local Board, Bardoli.	Do.	Do.	Do.	Well bore 40' x 6".	1,592 2 6
62	Do. do.	Do.	Do.	Do.	Well bore 36' x 5'.	402 15 3
<i>Panch Mahals District</i>						
63	Taluka Local Board, Godhra.	Gaoth a n well.	Godhra	Tuwa	Well bore ..	..

Cost of bore to the well owner. Total of columns 12, 13 and 14	Cost per foot to the well owner	Grand Total cost of bore inclusive of well owner's and Departmental cost. Total of columns 15, 16 and 17	Grand Total cost per foot	Object of boring, i.e., agriculture or gardening or drinking	Remarks, i.e., successful, unsuccessful, incomplete, on hand, abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
....	....	....	....	....	Bore completed at 154 feet last year, was rejected on account of boulders.
676 7 6	3 3 0	2,903 15 6	17 2 1	Drinking	Successful.
464 9 6	2 9 0	2,685 14 6	14 15 4	Do.	Do.
....	....	....	....	....	In progress.
111 0 0	4 1 5	306 14 3	11 5 10	Drinking	Successful.
199 6 0	3 6 0	842 15 10	14 2 4	Drinking	Successful. Last year's 40 feet rebored.
....	....	....	....	....	In progress.
103 8 0	3 4 0	526 4 2	10 8 4	Drinking	Successful.
42 12 0	1 10 3	231 2 2	8 14 3	Gardening	Do.
99 0 0	1 6 0	621 6 0	8 10 1	Drinking	Unsuccessful.
50 0 0	3 2 0	166 1 4	10 6 1	Do.	Successful. Bore of 50 feet further deepened. Hence the charge is at Rs. 1-8 per foot.
....	....	....	....	....	In progress.
....	....	....	....	....	Do.
233 13 6	6 10 9	666 15 6	19 0 10	Drinking	Successful.
287 10 0	4 7 0	1,079 10 0	16 13 11	Do.	Do.
390 8 0	2 6 6	2,395 4 0	14 12 7	Do.	Unsuccessful.
170 8 0	4 2 6	677 14 0	16 8 6	Do.	Successful.
....	....	....	....	....	Successful. Particulars not received from the Board.

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Diameter of the bore
1	2	3	4	5	6	7
<i>East Khandesh District</i>						
64	President, Dharangaon Municipality.	Gaoth a n well.	Erandol	Dharangaon	Well bore 40' x 10'.	3 1/2'
65	Do. do.	Do.	Do.	Do.	Well bore 35' x 10'.	3 1/2'
66	Do. do.	Do.	Do.	Do.	Well bore	2 1/2'
<i>West Khandesh District</i>						
67	Mr. Sambhubhai Desai	Gaoth a n well.	Nandurbar	Nandurbar	Well bore 36' x 5'.	6"
68	Mr. J. S. Shah	Do.	Do.	Do.	Well bore 50' x 30'.	6"
<i>Jawhar State</i>						
69	Administrator, Jawhar State.	88	Jawhar	Jawhar	Well bore 14' x 24'.	3 1/2'
70	Do. do.	139	Do.	Do.	Well bore 30' x 24'.	3 1/2'
<i>Poona District</i>						
71	Cammandant, Marine Battalion, Bombay Pioneers.	62	Haveli	Dhanori	Well bore 42' x 24' x 24'.	3 1/2'
72	Do. do.	62	Do.	Do.	Do.	3 1/2'
73	Mr. V. M. Dike	809, Sada-shiv.	Do.	Poona	Surface	3 1/2'
74	Secretary, Club of Western India, Poona.	P o o n a Camp.	Do.	Do.	Well bore 35' x 10'.	3 1/2'
75	Mr. G. J. Vinze	237, Sada-shiv.	Haveli	Do.	Surface	3 1/2'
76	Mr. Dwarkadas Jinabhai		Mawal	Shelatani	Well bore 40' x 20' x 20'.	3 1/2'
77	R. B. Hanmantram	B. No. 20, Kirkee Road.	Haveli	Poona	Surface	6"
78	Principal, Law College, Poona.	College ground.	Do.	Do.	Do.	6"
79	Executive Engineer, Minor Irrigation Works, Poona.	Khada k-wala Dam.	Do.	Kapre	Do.	6"
80	Do. do.	Do.	Do.	Do.	Do.	6"
81	Do. do.	Do.	Do.	Do.	Do.	6"

Depth of actual bore	Water before bore in gallons per hour	Water after bore in gallons per hour	No. of gallons increased per hour by boring	Labour charges	Cost of fuel, lubricating oil, coal, carting, castings, cutting shoe, etc.	Departmental charges for the well owner called Flat charge	Average Departmental expenses on the bore including
							Supervision and Depreciation charges
8	9	10	11	12	13	14	15
				Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
50'	NH.	240	240	245 10 0	15 0 0	50 0 0	48 11 2
3'-9"	..	..	..	....	....	....	....
17'-6"	..	..	..	....	....	....	....
163'	NH.	104	104	241 11 0	438 3 0	NH.	415 2 3
93'-7"	NH.	..	..	....	....	....	....
65'	NH.	NH.	NH.	94 8 0	5 0 0	NH.	63 4 10
21'-6"	NH.	NH.	NH.	42 0 0	2 0 0	NH.	20 15 0
41'-6"	NH.	..	..	NH.	11 4 0	NH.	40 6 8
58'-8"	NH.	15	15	NH.	14 0 0	NH.	56 15 8
27'-6"	NH.	240	240	64 4 0	31 6 0	27 8 0	26 12 7
35'-8"	NH.	240	240	....	....	....	....
25'-6"	NH.	240	240	52 8 0	22 7 0	25 8 0	24 13 5
30'	..	..	..	....	....	....	....
200'	NH.	340	340	50 10 0	174 6 0	275 0 0	509 6 0
169'	..	..	..	....	....	....	....
19'-7"	NH.	NH.	NH.	....	....	30 0 0	....
23'	NH.	NH.	NH.	....	....	23 0 0	....
36'-3"	NH.	NH.	NH.	....	....	36 4 0	....

Serial No.	Name of well owner	Survey No.	Name of Taluka	Name of Village	Surface bore or well bore with dimensions of the well	Average Departmental expenses on the bore including Running expenses, mechanic's wages and repairs
1	2	3	4	5	6	16
<i>East Khandesh District</i>						
64	President, Dharangaon Municipality.	Gaot h a n well.	Erandol ..	Dharangaon ..	Well bore 40' x 10'.	Rs. a. p. 314 1 0
65	Do. do. ..	Do. ..	Do. ..	Do. ..	Well bore 35' x 10'.	..
66	Do. do. ..	Do. ..	Do. ..	Do. ..	Well bore ..	..
<i>West Khandesh District</i>						
67	Mr. Sambhubhai Desai ..	Gaot h a n well.	Nandurbar ..	Nandurbar ..	Well bore 30' x 5'.	2,309 9 9
68	Mr. J. S. Shah ..	Do. ..	Do. ..	Do. ..	Well bore 50' x 30'.	..
<i>Jawhar State</i>						
69	Administrator, Jawhar State.	88	Jawhar ..	Jawhar ..	Well bore 14' x 24'.	468 4 0
70	Do. do. ..	139	Do. ..	Do. ..	Well bore 30' x 24'.	134 0 9
<i>Poona District</i>						
71	Commandant, Marine Battalion, Pioneers.	62	Haveli ..	Dhanori ..	Well bore 42' x 24' x 24'.	257 8 6
72	Do. do. ..	62	Do. ..	Do. ..	Do. ..	364 5 0
73	Mr. V. M. Dike ..	809, Sada-shiv.	Do. ..	Poona ..	Surface ..	172 7 9
74	Secretary, Club of Western India, Poona.	P o o n a Camp.	Do. ..	Do. ..	Well bore 35' x 10'.	..
75	Mr. G. J. Vinze ..	237, Sada-shiva.	Haveli ..	Do. ..	Surface ..	150 14 9
76	Mr. Dwarkadas Jinabhai ..	..	Mawal ..	Shelatani ..	Well bore 40' x 20' x 20'.	..
77	E. B. Hannantram ..	B. No. 20, Kirkee Road.	Haveli ..	Poona ..	Surface ..	1,065 10 0
78	Principal, Law College, Poona.	College ground.	Do. ..	Do. ..	Do. ..	..
79	Executive Engineer, Minor Irrigation Works, Poona.	Khada k-w a s i a Dam.	Do. ..	Kapre ..	Do. ..	..
80	Do. do. ..	Do. ..	Do. ..	Do. ..	Do. ..	..
81	Do. do. ..	Do. ..	Do. ..	Do. ..	Do. ..	..

Cost of bore to the well owner. Total of columns 12, 13 and 14	Cost per foot to the well owner	Grand Total cost of bore inclusive of well owner's and Departmental cost. Total of columns 15, 16 and 17	Grand Total cost per foot	Object of boring, i.e., agriculture or gardening or drinking	Remarks, i.e., successful, unsuccessful, incomplete, on hand, abandoned
17	18	19	20	21	22
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
310 10 0	6 3 0	673 6 2	13 7 6	Drinking	Successful.
....	....	....	....	....	Rejected on account of boulders.
....	....	....	....	....	In progress.
679 14 0	2 15 0	3,404 10 0	14 7 0	Drinking	Unsuccessful. Last year's work 72 feet.
....	....	....	....	....	In progress.
90 8 0	1 8 0	571 1 4	8 12 6	Drinking	Unsuccessful.
44 0 0	2 0 8	108 15 9	9 4 0	Do.	Do.
....	....	....	....	Drinking	Unsuccessful. No hired labour was engaged.
....	....	....	....	Do.	Do. do.
123 2 0	4 7 8	322 6 4	11 11 7	Do.	Successful.
....	....	....	....	Gardening	Successful. Experimental bore.
100 7 0	3 15 0	285 3 2	11 2 11	Do.	Successful.
....	....	....	....	....	In progress.
500 0 0	2 8 0	2,975 0 0	14 14 0	Gardening	Successful.
....	....	....	....	....	In progress.
....	....	....	....	....	Trial bore for sounding foundation for a new dam. Last year's work 10 feet 5 inches.
....	....	....	....	....	Trial bore for sounding foundation for a new dam.
....	....	....	....	....	Do. do.

Note.—The nett cost to Government per foot will be available on deducting the Flat charge in column 14 at Rs. 1 for the first 50 feet and at Rs. 1-8 beyond and the charge per foot to the well owner shown in column 18 from total cost per foot shown in column 20.

W. M. SCHUTTE,
Agricultural Engineer to Government,
Bombay Presidency, Poona.

APPENDIX Q

SUMMARY OF WORK DONE UNDER THE HORTICULTURIST
TO GOVERNMENT, BOMBAY PRESIDENCY, POONA,
FOR THE YEAR 1929-30

Staff.—Owing to the retirement of Mr. P. G. Joshi, on 31st March 1931, Mr. P. G. Dani, has taken charge of the Ganeshkhind Botanical Gardens, Kirkee. Mr. V. H. Kulkarni, has been appointed as Superintendent, Modibag. Mr. S. S. Bhat, has been appointed as Demonstrator in Horticulture. Mr. G. B. Deshmukh, has been called back from Alibag and will work in the Ganeshkhind Botanical Gardens.

Financial Condition.—There is no improvement in the financial condition. There are further reductions in the grants.

Teaching.—The University of Bombay has conferred the degree M.Ag., on Mr. V. H. Kulkarni. Mr. Kulkarni submitted his thesis on the "Preservation of Lime juice and its Economic Value".

Out of 12 students who appeared for the optional Horticulture II have passed their final B.Ag., examination.

The necessity for an Assistant Professor of Horticulture has been keenly felt. Our teaching and research work is increasing every day. It is essential to have a whole time worker for the future development of this work.

Laboratory work.—All the work done on lime juice is briefly summarised in the scheme that has been proposed and is being revised for submission to the Imperial Research Council. This work will be published in due course of time.

Short notes on candying of Bar, preparation of Fruit jellies and syrups are published in the Agricultural College magazine for the year 1929-30. Work regarding Cape Gooseberry jam is interesting. Cape Gooseberry gives very palatable and delicious product. A necessity for well equipped laboratory to carry out this work is keenly felt.

A scheme as regards cold storage experiments on mango and other fruits has been prepared for the consideration of the Imperial Research Council. It is hoped that cold storage apparatus will be installed in the near future.

Publications.—Bulletin No. 156 "Grape cultivation in Western India" by Mr. S. R. Gandhi.

Bulletin No. 162 "Papaya cultivation in Bombay Presidency" by Dr. G. S. Cheema and P. G. Dani.

Leaflet No. 2 "Bamboo Baskets versus wooden cases" for packing mangoes.

Transport and Marketing.—Observations have been made on the export of Alphonso mango to Aden, Cairo, Marseilles and London. It is observed that Alphonso reaches Europe in good condition and fetches good price in the market of London as well as Marseilles. Consignments

which were sent in cool room reached England in exceptionally good condition. The temperature in the cool room is about 40° to 45° F.

The result of packing experiments is given in the leaflet No. 2 "Bamboo baskets versus Wooden Crates". Wooden cases are more useful in checking damage to fruits in the transit than baskets and are found more economical in the long run as they can be used over and over again.

Observations on the grading of mango were also made on fairly large scale. These observations are being repeated this year. It is difficult at this stage to say if grading is profitable under the existing market conditions.

The total quantity of fresh fruits and vegetables imported into Bombay by Land and Sea, the system of marketing such products and the transport facilities available have been thoroughly studied. The results will be submitted after the final recommendations to improve the situation have been definitely framed.

Ganeshkhind Botanical Gardens, Kirkee

During the year under report the remodelling of this garden has been taken in hand. Old plantations are being cut down and plots levelled. These plots will be used for the cultivation of our selections of Guava, Pomegranates and other crops the value of which we have been reporting from time to time.

Figs.—The variety plot has not given any fruit worth recording. The plants are being properly cultivated and every care is being taken to make them bear fruit.

Guava.—Our selected strains are flourishing. Their fruits have been examined in the Crawford Market, Bombay. The Superintendent of Markets reports that the fruits are a wonderful improvement on the bazar guavas and will sell well. We have planned out extensive plantations under these strains now.

Banana.—A large number of seedlings have fruited. There suckers are preserved for further trials. It is not possible to say at present if these seedlings will give better types of Banana which we are trying to find.

Top working of mango.—Mango plants at Nigde were successfully top worked and the whole area has been handed over to the Forest Department for further care. The value of this work will be seen when the plants bear fruits.

Pomegranate.—Our "Kabuli" pomegranate has borne fruit. Fruit was examined in the Crawford Market, Bombay. The seed is soft, juice abundant, and taste agreeable. This selection marks a great improvement over our existing types. This type is propagated by means of cuttings for distribution in the district.

Citrus Die-back.—A new set of experiments as suggested in the scheme approved by the Director of Agriculture has been laid out. It is

difficult to forecast any result at present. The results of previous experiments are given in the Bulletin No. 155 of 1925 "Die-back disease of Citrus trees and its relation to the soils of Western India". The value of Kavath as well as many other stocks is under trial in connection with these experiments. Both Santra and Mosambi are doing well on Kavath. The effect of manures also is being tested on a large scale.

Modibag Agricultural College, Poona.

Figs.—This year's crop was treated with sulphur dusting and the result was very good. The imported varieties from Bagdad do not seem to have acclimatized yet. They do not produce satisfactory fruit.

Pomegranate.—As was mentioned in the last year's report the pomegranate plot was divided into two sub-plots to get a comparative idea of different Bahars. The results are not very encouraging. Perhaps this observation will be discontinued from next year. As regards wet rot disease the work will be continued.

Grapes.—This year's crop was seriously affected with Downy Mildew. Consequently the bearing was very thin. Observations on downy mildew will be made next year. Observations on the varieties will be continued.

Breeding and selections of grapes.—Of all the seedlings vine No. 7 seems to be very vigorous in growth. It is a self-fertile type of Pandhari Sahebi. Its yield is being tested. This type is expected to create a great interest among the public. It will now be trained on a bower system as well as Kniffen system to find out how it gives the best yield.

Citrus.—The Italian lemon and Navel Orange are the new introductions. Arrangements are being made to propagate these on a large scale for distribution to the public. The newly opened plot of Navel oranges is progressing well.

Observations on Citrus stocks will be continued. So far Jamburi and sour orange are found to grow most vigorously in the nursery. Their influence on the yield of Mosambi will be observed.

Papaya.—A plantation has been raised for testing the influence of heading back on the yield.

A new planfation also has been laid out with plants raised from seeds obtained from a male papaya plant to find the percentage of male to female. A trial has been given to Ceylon papaya also.

Cape-Gooseberry.—This crop taken as an inter crop in the mango plantation proved to be very paying. It gave an income of Rs. 165 from an area of 30 gunthas. The fruit was mostly sold in the form of jam, which was reported to be very delicious. A leaflet on the preparation of jam will be soon published for general information.

Mango.—Observations on the stocks and alternate bearing of mango are in progress. At present it is difficult to make any statement. The stocks have not borne enough fruit which can be tested.

Irrigation experiments.—As a result of irrigation observations the quantity of water which is at present applied to each crop is definitely ascertained. An idea as to the value of various systems also has been gathered. Our future plans in this directions will be soon settled and this work will be continued.

Advisory and District Work

During the year under report 845 enquiries have been received. This year five Horticultural classes at different places were held and particularly the classes at Ankola, Satara, Jambul and Halyal were very popular and the students varying from 50 to 80 took advantage of each class.

The magic lantern lectures were also given at these places as well as in many other places.

Demonstrations on Horticultural subjects were held at Rahata, Khed Shivapur, Narayangaon, Bordi, Mundgod and Pala which were largely attended by the farmers. At most of these places public lectures on Horticultural subjects were also given.

In Poona we held an Arboricultural Class which was attended by eight students deputed by the Public Works Department. This class lasted for one and half month.

A large number of improved new seeds and plants such as Bonny Best Tomato, Washington papaya, Navel orange, Italian lemon, Basrai banana suckers, American Strawberry varieties and Kew and Queen pine apples have been planted in the districts in the growers' fields. Our trials of figs, grapes, pine apples, and testing of fruit trees on salt lands in co-operation with the Irrigation Department as well as Agricultural Schools are also in progress. As a result of these observations there is a good deal of extension in fruit cultivation in the irrigated tract.

Besides this, a study of the Marketing System in the Presidency was taken in hand. A good deal of information on this point has been collected. These results will be submitted in time. 50 thousand (fifty-thousand) budded plants have been sold during the year under report from the various nurseries in the District of Poona.

APPENDIX R

SUMMARY OF WORK DONE UNDER THE INSPECTOR OF AGRICULTURAL
SCHOOLS, BOMBAY PRESIDENCY, POONA,
FOR THE YEAR 1929-30

Staff.—The permanent incumbent Rao Saheb K. M. Pawar having continued to act as Deputy Director of Agriculture, N. C. D., Nasik. I acted as Inspector during the year under report. The period of entertainment of the temporary post of Itinerant weaving assistant being over on 28th February 1930, the services of the weaving assistant were dispensed with from 1st March 1930.

Nature of work.—The nature of work has been mainly advisory both in respect of Vernacular Agricultural Schools and the agricultural bias classes. During the inspection, some model lessons are given to the boys so as to show the teachers how the instruction should be imparted in the different subjects and which of the portions should be emphasised and carefully attended to.

Vernacular Agricultural Schools.—The number of these schools remained the same as before, viz. six. Owing to heavy annual expenditure on the schools, Government have decided not to increase their number in their present form but have been thinking of trying an experiment of Earning while Learning by admitting fairly bigger boys willing to undertake hard work. This experiment, which if carried by properly selected staff at a suitable locality will surely be successful, will give an opportunity to many private bodies like the District Local Boards and Development associations to open such schools, the staff and a small piece of land for tuition purpose being provided by Government. The present Vernacular Agricultural Schools being worked, since long, on old lines and the staff and boys being used to the old system, it is rather difficult to expect the staff to change the system whole sale as demanded by the new scheme of Earning while Learning. It seems therefore advisable to try the experiment in a new locality, free from the atmosphere now prevailing at the agricultural schools, with a set of few fairly big boys capable of enduring hard labour with some preliminary education sufficient to understand the why and the how of the different agricultural operations so as to impress on their minds the importance of the operations.

The curriculum.—Though this remained theoretically the same attempts have been made to make the teaching more practical. Much of the time which can be utilised for practical work is still spent in class rooms. The curriculum and the method of teaching need radical change and with the introduction of the scheme of Earning while Learning which is to be tried, this change will be effected.

The work of the different agricultural schools

Loni School.—This is the premier school in the Presidency. During these two years, this school has shown remarkable progress in the development of the Farm which formerly yielded no good crops. With proper handling or rather treatment of the soil which is sticky and saltish, the very land has now been yielding very good crops. Mr. Chaugula, the present Head Master, is to be congratulated for the good management of the Farm. This school has also developed the Poultry Section in which Mr. Khot, the Graduate Assistant has specialised himself to a certain extent. Since the old Syllabus has been retained, the staff still continues to spend much time in class rooms which could more advantageously be utilised for some practical work bringing money into the pockets of the boys. But owing to the influence of the existing atmosphere, which has been contaminated since long, it seems rather difficult to induce the present type of the boys to take to some work giving them an earning for themselves.

Devi-Hosur School.—This is the second of the agricultural schools opened in the Presidency. This school has been doing very good work and a greater portion of boys passed out of this school have been doing good work on their lands. Mr. Pawate, present Head Master, has been trying his best to make the school work more practical in nature and he has greatly developed the Farm and the minor industry work. The boys of this school are found to be more industrious and hardworking than those at any of the other agricultural schools and this is probably due to the strictly rural atmosphere which the school has been able to maintain and the necessity of hard and continuous work on the Farm on account of the small number of boys when compared to the area managed and the favourable agricultural season in this tract affording work for boys all the year round, though there is very little of gardening. This is the only school which has arranged to keep itself in close touch with the work of the past students many of whom are found to attend the Social Gathering of the school when the report of work done by them is read and prizes are awarded. The school has also started a Co-operative Society for the boys and also a Library which has a permanent fund of Rs. 400 besides the amount of annual subscriptions from the boys. As a good foundation has once been laid, it remains for the successors to develop. Thanks are due to Rao Bahadur Shetti of Devi-Hosur who has been helping this school from the beginning as though it is his own. It is worth noting here that many candidates seeking admission, come for personal interview and preliminary test which has not been possible at other schools. There were 140 applications this year.

It is here that the scholarship system was first introduced with success though with the unwilling consent of the then Director of Agriculture. The cultivators of this Division have shown earnestness for this type of education and the number of candidates seeking admission has been fast increasing. It is however regretting to note that many of the boys

from Karwar District are seeking admission only for the sake of service and these boys have been spoiling the school atmosphere.

Jambul School.—This school has not been improving, appreciably. There is still the difficulty of securing boys for the school. Owing to the opening of agricultural classes at Rajapur High School, the number of boys at Jambul School is likely to go lower down. Though the late Rao Saheb Pishal has given the school, land, etc., free, the malarial climate of the place is affecting the health of both boys and staff every year very seriously and this year was no exception. The present Head Master Mr. Jambhekar has been trying to improve the teaching at the school and also the account and other matters left in hopeless state of confusion by the previous staff. The garden area of the school has been greatly developed. During the year, an horticultural class was arranged at this school and the boys and cultivators were greatly benefited by the practical instruction. Owing to the peculiar nature of the agricultural season in this tract, the time of school vacations need change to suit the agricultural work.

Dhulia School.—This has been doing fairly good work. But the boys have not got practical work all the year round since cropping is mostly confined to the rains. There is great tendency of boys joining this school for seeking service.

Godhra School.—This school is mainly attended by boys from the districts of Kaira and Panchmahals who have, of late, been very much influenced by the Vernacular Final certificate with agricultural bias and have not been joining the school on this account and the number has greatly fallen down. This is due to the want of skill on the part of staff in handling the boys who used to be very cheerful as long as Mr. Naik was the Head Master. Since his transfer after his serious illness at this school there has been some sort of trouble amongst the staff members who have in their turn given cause for discontent amongst the boys. The matters do not yet seem to have improved under the present Head Master. It seems advisable to retain only one agricultural school in the Division.

Surat School.—This has been doing very good work and the boys are always found to be cheerful. Mr. Naik has got a knack of handling boys and staff and also of developing only the work which, being appealing to the boys, is of great practical use to them. He has developed weaving and workshop to a great extent and boys have been nicely preparing whole implements and weaving good cloth on the Fly Shuttle Loom. This school has a disadvantage of not having a suitable garden piece.

Inspection and Examination

The inspection was conducted by me but due to the increase in the number of the agricultural bias classes, sufficient attention could not be given to the agricultural schools, some of which required closer and more frequent attention. The examination was conducted by me in

company with the local examiners deputed by Divisional Deputy Directors to help me in this work. The results have been given below :—

Name of the schools	Number appeared			Number Passed			Promo- ted boys	Remarks
	Boys in		Tea- chers	Boys in		Tea- chers	In I year	
	I year	II year		I year	II year			
Loni ..	22	13	5	20	18	5	..	One boy could not appearing owing to attack of Small Pox. He has been re- commended for pro- motion.
Devi-Hosur ..	13	10	5	10	8	4	3	
Jambul ..	13	7	..	11	7	..	..	
Dhulia ..	16	15	..	14	15	..	1	
Surat ..	13	12	..	11	10	..	2	
Godhra ..	8	7	..	8	6	..	..	

All schools except Godhra and Jambul have done fairly well in the examination. The real test of boys at such vocational schools can only be made after the boys take to their home-farming. To increase the efficiency of such schools it is necessary to keep in close touch with boys' work after they leave the school.

Recording of past students' history of work.—Attempts are being made to keep the record of work of past students—through the District staff. But from the reports received, it does not seem possible to get accurate information since in some cases D. A. Os. can't visit these places due to want of funds and miscellaneous duties entrusted to them. This work may be entrusted to the respective schools by giving some additional staff so as to relieve the Head-Master to attend to the work of past students which is very important.

Work of the weaving assistant.—One of the staff-members at the different agricultural schools has now been trained in weaving on the Fly Shuttle Loom and weaving work has thus been greatly developed since it has appealed to the public.

Devi-Hosur school which was the first to start weaving has specialised in this work and has been preparing variety of things useful for the agriculturists. The bags required to fill in Farm cotton (in Dokras) were woven by the boys themselves during the year. The temporary weaving assistant at this school who is a past student of this school is a very intelligent and practical man.

Agricultural bias classes.—There are 75 classes in the Presidency proper and 9 classes in Sind besides the 4 classes under the various missions. The practical difficulties in respect of these classes continued to exist. With a view to thoroughly discuss various points in respect of these classes, which are for the present left to their own fate, it is necessary that the officers of the Local Boards, Educational and Agricultural Departments should meet together at an early date. Else the movement will be at a standstill or may even die out if the state of things continue as at present.

Training of teachers for agricultural bias classes.—The system of training few teachers at the agricultural schools at Loni and Devi-Hosur continued. But since Government insists that the Boards should pay their shares of expenditure for training these teachers, many Boards have not been deputing teachers for training and consequently number of agricultural bias schools in these districts cannot be increased.

Since this arrangement of training teachers at the agricultural schools has been made only as an emergent measure, Government have arranged to open a Rural Training School at Narayangaon. But nothing in respect of syllabus and staff so as to be of use to the development of the agricultural bias movement seems to have been yet definitely settled. During the year under report a majority of the ordinary vernacular final boys were admitted at this training school and some attempts seem to have been made to give them agricultural lessons along with others by having a farm attached to the school.

R. Y. HULKOTI,

Inspector of Agricultural Schools,
Bombay Presidency, Poona.

APPENDIX S

SUMMARY OF WORK DONE UNDER THE PROFESSOR OF
AGRICULTURAL ECONOMICS FOR THE YEAR 1929-30

Rao Bahadur P. C. Patil continued as Professor of Agricultural Economics throughout the year except from 1st May 1930 from which time he went on four months' leave. In addition to his duties as Professor of Agricultural Economics, he acted as Principal of the Agricultural College from 7th September 1929 till the day he went on leave.

Mr. T. G. Shirname, B.Ag., continued to be Demonstrator in Agricultural Economics till 30th April 1930. From 1st May 1930 he was appointed Lecturer in Agricultural Economics and took charge of the office of the Professor of Agricultural Economics vice Rao Bahadur Patil gone on leave.

Mr. T. B. Pawar, B.Ag., graduate assistant continued to be under me for district work.

Mr. K. M. Shah, B.Ag., graduate assistant, was temporarily attached to this office from 22nd July 1929, for training as Demonstrator in Agricultural Economics to take place of Mr. Shirname appointed Lecturer in Agricultural Economics from 1st May 1930.

Messrs. Shah and Pawar did their work well though the assistants are too few for the teaching and investigation work.

The work of my section chiefly consists of (1) Teaching and (2) Research.

(1) *Teaching*

Agricultural Economics is taught in the junior B.Ag. and senior B.Ag. as a compulsory course and also to the students in the senior B.Ag. class who take Advanced Agricultural Economics as their optional subject. There were 61 students in the junior B.Ag., 61 in senior B.Ag. and 15 in the optional group of Advanced Agricultural Economics. The subject of compulsory Agricultural Economics goes in the group "General Agriculture" and the result of Agricultural Economics for compulsory course cannot, therefore, be given separately. Seventeen students (including two old students) who had taken Agricultural Economics as their special subject, appeared for their B.Ag. examination. Sixteen passed in all subjects and obtained their degree. One of these sixteen stood first among the successful candidates in B.Ag. Last year also one of the Agricultural Economics students stood first class first in his degree examination.

As is done every year, the special Agricultural Economics students were asked to collect first hand information from the village records of Loni Kalbhor, an irrigated village about 11 miles to the east of Poona and submit separate papers. Each of the special students was also asked to write a paper on the economics of a rural co-operative credit society of the place from which he came. This work was allotted to them for their October vacation. Both these papers along with others were submitted for their University Examination.

(2) *Research*

The post of Professor of Agricultural Economics was created in 1925 more with a view to take up research into the financial position of each important branch of Agriculture and a study in detail of the economic condition of each district with special reference to certain areas which appeared to show signs of retrogression. About the same time, however, the University of Bombay revised its Agricultural course. Farm Management and Agricultural Economics were made as a necessary portion of the course for all students and Advanced Agricultural Economics was given a place in the optional groups. The number of students, taking Advanced Agricultural Economics as their optional, is increasing year after year. Consequent upon these changes the section with its small staff has got full teaching work.

However, with the help of a graduate assistant and a little money spared by the Director of Agriculture, the section has been able to conduct some research. During the first three years (1925-26 to 1927-28) research in the cost of production of important crops was conducted. Over 350 acres under different crops like sugarcane, bajri, jowar, wheat, gram, groundnut, etc., were fully costed* and reports submitted to the Director of Agriculture, Bombay Presidency, Poona.

Since 1928-29, we have been conducting research in cost accounting, embracing the study of the whole of the farm unit. During 1928-29 and 1929-30, twenty-two farms ranging in size from 7 to 49 acres were fully costed*. The total area of these 22 farms was over 550 acres. Such studies are found to be more useful and interesting since they tell the whole story of the business of a number of peasant cultivators. These farm studies were conducted through the following agencies :—

(a) 7 farms through the Graduate Assistant attached to my office for research work,

(b) 11 farms through the agricultural bias class teachers, and

(c) 4 farms through the graduate assistants under the Deputy Directors of Agriculture, S. D., N. C. D. and Konkan.

Figures collected in 1928-29 have already been collated and a report prepared. Figures for 1929-30 are being worked out and a detailed and exhaustive report on the study of the 22 farms in two years will soon be submitted. As an example, however, I give below a very brief summary of the economic position of a farmer from Dhurkheda near Shahada in the West Khandesh District. (The data was collected by me in 1928-29 through the District Agricultural Overseer, Shahada, under the Deputy Director of Agriculture, N. C. D.)

This farmer possessed 49 acres and 9 gunthas of land under dry cultivation. The farmer's family consists of himself, his wife and three children all below 6 years. As is usual with most of the cultivators of the village, the farmer and his family rarely work in the fields. He had engaged two permanent servants (*Salkaris*) who were paid Rs. 215 for

*On the basis of the bazaar wage.

one year. A regular roll call was kept of the farmer and his wife and of the two servants from July 1928 to April 1929 or for 304 days. The farmer and his wife make two units of labour per day and out of the 608 available labour units (304×2) during this period, the farm family put in only 15 days of work or only 2.47 per cent. of the available labour was employed. The two servants together put in 537 days' work out of 608 (304×2) or 88.32 per cent. of their labour was utilized. Besides Rs. 115 were paid for daily paid and contract labour engaged at the time of sowing, weeding and harvesting.

The costs and receipts from the different crops grown on the farm in 1928-29 were as follows :—

No.	Name of crop	Area	Value of produce	Cost of production excluding wages for home labour	
				Out of pocket expenses	Interest on working capital
		A. g.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Cotton ..	24 3	488 0 0	446 0 4	35 12 1
2	Groundnut ..	1 0	25 0 0	27 2 10	1 14 9
3	Jowar ..	4 0	210 0 0	88 7 6	11 11 2
4	Gram ..	1 0	23 0 0	30 10 0	4 4 6
5	Wheat ..	19 6	1,104 0 0	477 14 4	50 15 11
Total ..		49 9	1,850 0 0	1,070 3 0	104 10 5

No.	Name of crop	Cost production excluding wages for home labour— <i>contd.</i>		Family labour income (<i>plus</i> or <i>minus</i>)
		Rent of land excluding assessment and local Fund Cess	Total	
		Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Cotton ..	364 15 3	846 11 6	— 358 11 8
2	Groundnut ..	14 3 4	43 4 11	— 18 4 11
3	Jowar ..	62 7 0	162 9 8	+ 47 6 4
4	Gram ..	15 9 9	50 8 3	— 27 8 3
5	Wheat ..	298 14 1	827 12 4	+ 276 3 8
Total ..		736 1 5	1,930 14 10	— 80 14 10

Note.—The out of pocket expenses are taken to include costs over manure, seed, permanent, servant daily paid and contract labour, depreciation on equipment, and on bullocks, assessment and local fund cess, cost of feed and fodder consumed by bullocks, the cost of their housing and their death allowance and the cost of marketing and ginning cotton.

Rs. 330 were expended for outside labour. Had the farmer and his wife worked themselves in the fields, they could have saved a very great part of this cost and would have made some labour income. But the indication of labour income shown in the above table does not tell the real economic position of the farmer. The rent of land and interest on working capital which are charged as costs in the above table were saved to the farmer since land and working capital were owned. If only the out of pocket expenses are deducted from the values of the different crops, we will get the farm business income or the aggregate income obtained by the farmer. Thus the business income made by the farmer from the different crops was as follows :—

No.	Name of crop	Area	Value of produce	Out of pocket expenses	Farm Business Income (<i>plus</i> or <i>minus</i>)
		A. g.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	Cotton	24 3	488 0 0	446 0 4	+ 41 15 8
2	Groundnut	1 0	25 0 0	27 2 10	— 2 2 10
3	Jowar	4 0	210 0 0	88 7 6	+121 8 6
4	Gram	1 0	23 0 0	30 10 0	— 7 10 0
5	Wheat	19 6	1,104 0 0	477 14 4	+626 1 8
	Total	49 9	1,850 0 0	1,070 3 0	+779 13 0

The gross income of the farm was, therefore, Rs. 779-13-0. It is chiefly because the land was owned and that the farmer could afford to engage two permanent servants. The yields obtained from all the crops grown on the farm were low. The soil of the fields held by the farmer was of deep black type. But some of the fields were very uneven and the growth of crops in the uneven portion of the land was extremely poor. Interculturing of crops, especially in the rabi season, is practically unknown in the village. With a little hard work in the fields and some more care of the crops, the farmer would have been able to make much more income.

Besides a great deal of information has been collected on the marketing of important agricultural products. All this information, however, is collected by occasional visits and found very useful for class work in making the subject of agricultural marketing more applied. A detailed exhaustive enquiry into the marketing of important agricultural commodities is, I think, long overdue and I hope Government will soon be able to find out money sanctioned in Government Resolution, Revenue Department, No. 7264/24, dated 18th November 1926 for groundnut marketing enquiry.

Publications and Reports

During the year under report the following two research reports were submitted :—

(1) Studies in the cost of production of crops in the Deccan No. 2
—Crops round about Poona in 1927-28.

(2) Studies in the cost of production of crops in the Deccan No. 3
—Crops at Narayangaon, Mohol and Ojhar in 1926-27 and 1927-28.
Study conducted with the help of some of the Agricultural Bias school teachers.

The following research report is under preparation and will soon be ready :—

(1) Farm Cost Studies in the Bombay Presidency in 1928-29 and 1929-30.

T. G. SHIRNAME,

College of Agriculture,
Poona, 14th July 1930.

I/c Professor of Agricultural Economics.

APPENDIX T

SUMMARY OF WORK DONE AT THE AGRICULTURAL RESEARCH
STATION, SAKRAND, FOR THE YEAR 1929-30

Administration.—I continued to hold the post of the Officer in Charge, Agricultural Research Station, Sakrand, during the year under report, in addition to my duties as Agricultural Chemist and Soil Physicist.

There are four main sections working at this Station, viz. (1) The Agricultural Section, (2) The Botanical Section, (3) The Chemical Section and (4) The Physiological Section. The last is financed by the Indian Central Cotton Committee. There is need for the organisation of one more section, viz. a Mechanical section. The Station possesses two steam engines, two pumping plants, two tube wells, one tractor, one motor car, one electric engine and other machinery which require more skilled attention than can be given at present.

The existing sections have been co-operating with each other for mutual and general good.

The modified *bosi* method of cultivation for growing wheat is becoming more and more promising. Under Barrage conditions, water will not be required for kharif crops like cotton after about the middle of October or, at the most, the end of October. However, wheat, which is the most important rabi crop, cannot be sown in October or early November, as, wheats, if sown early, are liable to damage by frost which generally occurs about the middle of January to the middle of February. For this reason wheat is generally sown from the third week of November to mid-December. Water for sowing wheat is required during this time. It has been found however that water can be utilised from the middle of October to the end of November by irrigating the wheat land as in *bosi* cultivation and by conserving the moisture till it is required at the time of sowing. In the *bosi* method of cultivation no water is available for irrigating the land just before sowing but under Barrage conditions water will be available and a light watering can be profitably given just before sowing to facilitate germination as the upper four or five-inch layer of the soil generally gets dry. This method is now in the final stage of trial and a definite announcement will be made in a year or so.

Another important fact that has been brought to light is that, from a local Sindhi wheat known as Phandani, a strain C.Ph. 47 has been found to be very promising as compared with Pusa 12. Accurately measured quantities of water and exactly similar cultural treatments were given to these two wheats and it was found that C.Ph. 47 gave more yield than Pusa 12 in all cases. Chemical analyses of the grain show that the protein contents of C.Ph. 47 also compare favourably with those of Pusa 12. Samples of these wheats have been sent to England for further tests of milling and baking quality.

Pusa 12 wheat, however, is known to be less susceptible to rust than C.Ph. 47.

**Climate.*—The highest temperature attained during the year under report at the station was 117° F. on 31st May 1930 and the lowest temperature was 33° F. on 10th February 1930.

Evaporation from plain water surface was at its maximum on the 17th June when it amounted to 1·3 inches in 24 hours. The minimum amount of evaporation was 0·05 inches in 24 hours during the last week of December and early January.

Wind velocity was highest on the 4th July 1929 being 17·4 miles per hour. The lowest wind velocity was 0·3 miles per hour on 17th December 1929.

The lowest relative humidity was 12 per cent. on the 25th April and early part of May.

The total rainfall amounted to as much as 20·36 inches during the year under report as compared to 2 inches in the previous year. The highest rainfall in a day was 6·74 inches on the 28th July 1929. There were unprecedented floods owing to the abnormal rise of the Indus water and the Agricultural Research Station, which was declared to be within the danger zone, was surrounded by water on all sides. For some time the only communication with the district town of Nawabshah was by means of boats plying through the Dad Canal. Most of the important scientific records were shifted to Nawabshah and the Station was practically evacuated. Urgent work was managed from time to time from Nawabshah. Mr. Khan Mahomed, non-graduate assistant in the Agricultural Section remained at the Station, night and day throughout the flood time and looked after the Farm property and buildings. No damage was done to the property of the Farm but most of the experiments on the water requirements of crops were vitiated on account of heavy rains.

Health of the Station.—The health of the Station continues to be fairly good. The supply of drinking water from the tube well is specially recognised to be very good.

Crop Pests.—The most important crop pest causing very great damage to the crops was the locust. These insects visited the Farm about twenty-five times in smaller or bigger swarms from June to December. At several places cotton in its younger stages was altogether ruined, and such areas had to be resown with *bajri* as the season was advanced. Great damage was done to *jowar* and *bajri* during October and November when the earheads were ripening. The swarms of locusts generally came from the north-west side and went towards the south-east.

Visitors.—During the year under report His Excellency the Governor of Bombay, the Commissioner in Sind, the Chief Engineer, Lloyd Barrage, and other officials visited the Station. The Honourable the General Member, the Finance Member, the Land Revenue Officer and the Manager of the Encumbered Estates also paid visits to the Station. The Collector of Nawabshah and some Zamindars were among the usual visitors to the Farm.

* The figures under this head were kindly supplied by the Cotton Physiologist, Sakrand.

Requirements of the Station.—The requirements of this Research Station are many. It has no library worth the name. A good library is most essential for a Research Station.

A power gin to gin the various cottons of the Farm and a threshing machine for wheat are necessary at the Station to ensure a pure seed supply for these two main crops under the Barrage area.

Residential quarters are necessary for clerks and for some graduate assistants who are at present housed in kaacha quarters. Such quarters are in danger of collapse in heavy rains which of late have become so common in Sind.

A bullock shed and implement shed are also required for housing the cattle and implements. These are only some of the more urgent requirements of the Station.

V. A. TAMHANE,

Officer in charge,

Agricultural Research Station, Sakrand, Sind.

Sakrand, 10th July 1930.

ANNUAL REPORT OF THE WORK DONE UNDER THE AGRICULTURIST,
AGRICULTURAL RESEARCH STATION, SAKRAND, DURING
THE YEAR 1929-30

I.—Administration

I held charge of the Agricultural Section throughout the year. There was no change in the establishment, but four members of the staff went on leave for periods ranging from one to five months on account of ill-health. Mr. Chowdhri was deputed to Nadiad for fifteen days to study improved methods of cultivation of tobacco and the curing of the product, and Mr. Abdul Hadi, non-graduate assistant was deputed to attend locust work for a period of twenty-four days at the very pressing demand of the Deputy Director of Agriculture, Sind.

II.—Season

The agricultural season of the year under report opened with a favourable rise in the river Indus. From 13th July to 27th August heavy rains fell all over the country and in the Punjab. By the time the monsoon was drawing to a close, the Shyok Dam burst and forced a very large volume of water down the Indus which had already risen to flood level on account of the heavy rains mentioned above. The result was that the river overflowed on both banks at several places throughout its course, and floods, unprecedented in the history of Sind, occurred and swept every thing before them. Several villages were submerged and in some districts loss of crops, property and cattle was unparalleled. To crown this, large swarms of locusts swept the country for not less than twenty-five times during the year so that *kharif* crops, which escaped damage from floods, succumbed to their depredations to a very large extent. On the other hand in some districts low lying areas did not dry in time to enable the cultivator to take full advantage of the available moisture and to sow *rabi* crops thereon, although at higher elevations, fields which were never cultivated with *rabi* crops matured good Jambho and wheat crops.

Rust and smut were observed on the wheat crop in certain localities.

On the whole, the season was exceptional and disastrous to the well-being of the Province.

Locally, Sakrand Lake rose to twenty-two feet on the gauge against sixteen feet, the highest flood level previously recorded and water was about three feet below the level of the Farm land. The factors enumerated above affected the experimental work adversely. The *bajri* crop was badly damaged by rain and locusts so that yields were not comparable. The duties of *kharif* crops, with the exception of early sown cottons, were considerably lowered, in spite of the fact that the total delta applied to the crop, including the rainfall, was just about normal. The total rainfall registered on this station during the year amounted to 20·36 inches, of which 19·2 inches fell in the *kharif* season between 13th July and 27th August.

III.—Water Supply

The pumping plants installed on the station worked for 2,922 hours and discharged 4,616 acre inches during the year. The total cost incurred on running the plants, repairs, wages, etc., amounted to Rs. 6,457-8-0. The cost of an acre inch therefore amounts to Rs. 1-6-4 only. This figure is slightly higher than that of the previous year. The tube well was worked for 53 days in the early part of the season for irrigation purposes while the "Dhund" supplied water for the remaining part of the year.

The work of the second tube well was commenced towards the end of the financial year and much progress has since been made.

IV.—Research and Experiments

The main work of the Agricultural Section is to investigate, from the practical and economical point of view, the problems related to perennial irrigation such as :—

1. Reclamation of salt infected land,
2. Maintenance of soil fertility under continuous cropping,
3. Testing of Project duties and schemes with a view to make economic production of crops possible within the available water supply,
4. Introduction of new crops and varieties of crops, and
5. Adoption of economic methods of cultivation and suitable implements for the improvement of the general agricultural practice of the Province.

1. *Kalar Reclamation*.—By far the most important problem is the reclamation of salt infected land which is more or less a predominant feature of Sind soils. As explained in last year's report, three holdings containing a varying intensity of salts have been set apart for the investigation of this problem. The cropping scheme of these holdings varies with the different intensity of salts contained in them. For instance Sakrand "A" deals with a high intensity of salts and thereon double cropping of the land, with berseem to follow *kharif* crops in the *rabi* season every year is being tried; Sakrand "B" and "C" deal with medium intensities of salts and partial double cropping of the land with berseem twice in three years and once every two years respectively is under test. The discharge of water is limited to one cusec for 370 acres in each case. The results are summarised below :—

Sakrand "A".—The year under report was the second year of the experiment. Cotton had to occupy eight acres according to the cropping scheme but the crop on three and a half acres was wiped out by locusts and was replaced by *bajri*. The surviving crop of four and a half acres, of which one acre was very poor due to the same causes, gave an average yield of 900 lbs. per acre. *Bajri* occupied the remaining eight acres of the holding but it had to be resown twice and finally locusts damaged the grain in the earhead stage so that very low yields (400 lbs. per acre) were obtained.

Berseem however came up satisfactorily on all the area, not excepting the portion where 8 per cent. salts were located and it gave four cuttings of which the first cutting yielded 8,320 lbs. of green fodder per acre, the second, 13,160 lbs. per acre, and the third and fourth were fed off to cattle. In kalar patches, where germination by ordinary method of sowing was faulty, corrugations were made and seed was sown in standing water. The result was that a good germination was secured.

Duties resulting from the cultivation of this holding are defined below :—

Crop	Area	Date of pre-liminary soaking.	Date of last watering	N	Delta Rain	Duty
Cotton ..	4½	27th April 1929	1st October 1929	= 158	78·14+90 168·14	101
Berseem ..	16	11th October 1929	19th April 1930	= 201	554·3	131

Judged by the stand of crops, the land enclosed in this holding seems to have improved considerably both as regards the texture of the soil and the fertility of the land. Undoubtedly berseem cultivation is largely responsible for this improvement.

Sakrand "B".—This was the second year of this experiment. The *kharif* crops in this systems, with the exception of *jowar*, suffered much damage from locusts and rain. About four acres of the cotton area had to be completely resown with *bajri* and the surviving crop was also not satisfactory.

Cotton yielded 698 lbs. per acre, calculated from the yield of four acres, of which the crop on two acres was poor. The yields of grain crops are shown below :—

				Lbs. per acre
<i>Jowar</i>	..	..	..	1,361
<i>Bajri</i>	..	..	..	630

In this experiment the cotton crop received a total Delta of 19 acre inches and rainfall amounting to 20 inches, so that the total quantity of water received by the crop amounted to 39 acre inches, only.

There were ten acres of berseem in this holding. The crop was good on the whole and all the green stuff was fed to cattle.

Wheat in this series occupied four acres where berseem had been grown in the previous year. The total yield obtained was 2,717½ lbs. which gives an average yield of 680 lbs. per acre. The *rabi* duties are as follows :—

Crop	Area	Date of pre-liminary soaking	Date of last watering	N	Delta	Duty
Wheat ..	4	13th November 1929.	18th March 1930	= 126	82	147
Berseem ..	10	12th October 1929.	23rd March 1930	= 163	307	120

The portions that were cropped with berseem in the previous year have shown a distinct improvement as revealed by the stand of the crops cultivated during the year under report.

Sakrand "C".—This was the second year of this experiment also. The *kharif* crops in this series suffered in common with others and the cotton area was reduced to four acres as the crop in the remaining four acres was completely wiped out and was replaced by *bajri*. *Bajri* suffered equally seriously both in its original area and in the area where it replaced cotton. Cotton, *jowar* and *bajri* yielded 710, 926 and 976 lbs. per acre respectively.

Wheat in this series occupied six acres but the crop was patchy and good portions had lodged badly. The average yield of 573 lbs. per acre was obtained. Jambho occupied two acres, of which half an acre was almost without a crop on account of excessive salts, and yielded 891 lbs. per acre. Berseem was satisfactory.

In this experiment berseem is to go over the area once in two years hence a longer time will be required to get satisfactory results as regards the improvement of the land. The duties are described below.

Cotton received 18·5 acre inches plus rainfall of 20 inches making the total quantity of 38·5 acre inches which is just about the normal requirement of the crop :—

Crop	Area	Date of soaking	Date of last watering	N	Delta	Duty
Wheat	6	14th November 1929.	23rd March 1930.	127	133·8	136
Berseem	8	21st October 1929.	25th April 1930.	186	201	124
Jambho	2	27th September 1929.	27th January 1930.	117	19·2	292

2. *Maintenance of soil fertility.*—The second important problem is the maintenance of soil-fertility under the continuous cropping scheme which will be practised when perennial irrigation is in full swing.

The system of rotation followed in Sakrand "D" prescribes a larger cultivation of leguminous crops both in *kharif* as well as in *rabi* with the object of increasing the organic contents of the soil. Berseem cultivation in this respect is superior to other leguminous crops inasmuch as it can be grazed down in the field three to four times during the season without harm to the crop but with much benefit to the land. The excreta of the animals grazing on berseem gets incorporated in the soil and thus much valuable organic matter is added.

The *kharif* cropping scheme of Sakrand "D", was badly affected by rains and locusts. Cotton, jowar and gowar were completely destroyed and *bajri* was sown in their place. However it yielded a poor crop, having been sown too late after repeated unsuccessful attempts to establish the original crops.

The *rabi* crops gave satisfactory results. Wheat yielded 910 lbs. per acre, berseem was all grazed down in the field and rape yielded 969 lbs. per acre. The *rabi* duties are as under:—

Crop	Area	Date of soaking	Date of last watering	N	Delta	Duty
Berseem	2	8th October 1929.	21st March 1930.	165	60.9	113
Wheat	4	30th October 1929.	23rd March 1930.	142	66.6	205
Rape	1	10th October 1929.	21st January 1930.	104	13.1	96 More water was given on account of Kalar.

The beneficial results of this rotation will be estimated when the second cycle of rotation is commenced.

The area of five acres reserved for artificial manure experiments was cropped with fodder in *kharif* and wheat in *rabi* to exhaust the land. The condition of the wheat crop all over this area was poor and indicates that the land has very nearly reached the stage of exhaustion. Wheat yielded 498 to 794 lbs. per acre in this series.

3. *Testing of Project Duties and Cropping Schemes.*—During the year under report a reduction by 15 per cent. was made in the water supply of these holdings in order to make them compare favourably with district conditions. This enhances the field duty to 120 for *kharif* crops.

In these experiments, the Project Scheme of the second decade is being put to a severe test both on sweet as well as on salt land. The percentage of crops proposed in the second decade is shown below:—

	Per cent.	Per cent.	Per cent.
<i>Kharif</i> —Cotton ..	15		
Other <i>kharif</i> ..	11		
Legumes ..	1		
	—	27	
<i>Rabi</i> —Wheat and oil seeds ..	30		
Legumes ..	2		
	—	32	
			59

Kharif results of the year were vitiated by excessive rain and locusts, hence *rabi* results are only shown below:—

Crop	Area	Yield of plot	Yield per acre	Remarks
Wheat ..	4	2,381½	595	E. Salt
Jambho ..	1	446	446	Do.
Gram ..	½	Failed	Nil.	Do.
Wheat ..	4	2,840	710	E. Sweet.
Rape ..	1	994½	994½	Do.
Gram ..	½	291	582	Do. Gram does not seem to thrive in this land.

The duties calculated from these experiments are summarised below:—

Crop	Area	Date of soaking	Date of last watering	N	Delta	Duty
E. Salt Wheat ..	4	23rd October 1929.	16th March 1930.	145	102	136
Jambho ..	1	28th September 1929.	14th January 1930.	109	13.3	200
E. Sweet Wheat ..	4	17th October 1929.	21st March 1930.	151	115.5	129
Rape ..	1	9th October 1929.	5th February 1930.	120	16.5	180
Gram ..	$\frac{1}{2}$	9th October 1929.	20th March 1930.	163	10.3	195

According to the Project report, 118 acres are to be cultivated in the *rabi* season in the second decade, hence it is fairly clear that quite a large quantity of water will be available for irrigation of *rabi* crops and for improvement of the land.

The wheat crop in E. Salt received six waterings of three acre inches each in addition to the initial soaking of 7.5 acre inches. The total quantity applied per acre amounts to 25.5 acre inches.

The wheat crop in Sakrand E. Sweet received six irrigations of three acre inch each, in addition to 11.5 acre inches of initial soaking. Rape and jambho received two waterings in addition to 8 inch soaking, the low yield of jambho being due to intense salinity of the land.

4. *Introduction of new crops.*—(a) Cotton 4 F. This variety continues to occupy the largest area on the Farm. It can be sown as early as the 1st of April with advantage and finishes off before the end of December when early frosts usually occur. During the year under report, it yielded 769 lbs. of seed cotton per acre calculated from the yield of 12 acres cultivated with it. The maximum yield obtained was 1,200 lbs. per acre. This variety appears well suited to Sind conditions generally.

(b) Jowar (Saorō kārthuho and Acho kartuho). Of these varieties Acho kartuho ripens earlier than the other. The average yield of Acho kartuho was 1,071 lbs. Saoro occupied half an acre and yielded 968 lbs. per acre.

(c) *Wheat, Pusa 12.*—As mentioned in the previous year's report, this variety has a future before it. Being one of the strong wheats, it is suited to foreign markets. The average yield obtained from the crop of 12 acres amounted to 766 lbs. per acre, the maximum being 1,664 lbs. per acre.

(d) *Berseem.*—Among the legumes, Egyptian clover occupies the first rank. It is kalar resistant and hence is a key to the solution of the problem of reclamation of saline land. It is a good soil renovator and improves the texture of the soil as well. It is a nutritive and palatable fodder for stock and milch cattle, yielding 24,000 to 50,000 lbs. of green fodder per season. In the Province of Sind, cattle keeping is a hobby of the cultivator and this crop should prove of great value when perennial

irrigation is available. Berseem seeding was a problem in Sind and the cost of imported seed a great hinderance in the expansion of this crop. But it has been made to seed at Sakrand successfully and it is hoped that before long a good quality seed will be available for issue at a cheap rate.

(e) *Tobacco*.—This crop completely failed owing to heavy rains in the seedling stage, and the season having far advanced, it was therefore dropped from the programme.

(f) *Ground-nuts*.—Spanish Pea-Nut and Big Japan were tried during the year with satisfactory results. The former yielded 1,800 lbs. of green nuts per acre while the latter gave 5,864 lbs.

(g) *Sugarcane*.—Co. 213 was again grown on the Farm with very good results. It yielded 53,000 lbs. of cane and the highest Brix reading of juice recorded was 18·07 on 23rd February 1930 after one year's growth. The crop was sown on 23rd February 1929. Total quantity of water applied to the crop plus the rainfall amounted to 104·89 acre inches.

(h) *Potatoes, Onion, Safflower, Linseed, Castor and Maize*.—These were grown as other money crops. Maize failed during rains. Potatoes yielded poor results due to bad seed and the rest gave satisfactory results.

(i) *Soy beans*.—This is a new crop which has come into prominence lately. Although the crop sown on the Farm during the year was submerged under two feet of rain water, the surviving plants showed that the crop will suit local conditions.

(j) *Oats*.—A Punjab local oat variety was sown on the Farm during the year and was a complete success. It yielded 31,000 lbs. per acre of green fodder and a small patch reserved for seed yielded over 1,600 lbs. of seed per acre. The fodder was good.

5. *Cultural methods and implements*.—Drilling cotton seed three feet apart and subsequent interculture of the resultant crop by means of bullock drawn implements have definitely proved economical and beneficial. Each hoeing with bullock power costs Re. 0-15-6 per acre, as against Rs. 8 to 10 per acre by manual labour. Besides, by interculturing the crop with the plough, being deeper than the hand hoeing, the soil gets fuller aeration and consequently becomes richer and bears a healthy and vigorous crop.

Irrigation of land in October and the practice of conservation of moisture have already been described in full in the past year's Annual Report hence no further comment is necessary.

Rabi Drill.—A three-coultered wooden drill costing Rs. 12, which can be made by any village carpenter, has given very satisfactory results. Two to three acres can be drilled in a day with the same amount of labour as is required to work the local one-coultered drill, which turns out only one acre in a day. The coulters are fixed 9 inches apart. The drill is chiefly suited for drilling wheat but gram can also be drilled with it. The germination of seed sown with this drill is quicker and more uniform than with the local drill.

V.—*Demonstration and Propaganda*

During the year under report, demonstration of *kharif* crops was dropped owing to the depression caused by floods, rains and locusts, but a large demonstration was organised in the *rabi* season at the time of the visit of His Excellency the Governor of Bombay and several other High Government Officials and other visitors. The seeds distributed during the year are summarised below :—

Name of variety	Quantity
	Lbs.
<i>Jowar</i> —Acho kartuho	1,335
Saoro kartuho	1,478
Allakh	410
Bagdar	565
Red Janupur	586
Red (fodder)	600
<i>Wheat</i> —Pusa 12	6,188

VI.—*Staff*

All the staff worked zealously during the year. Mr. Khan Mohamed, a Lyalpur trained non-graduate assistant, deserves special mention for the pluck and valuable services rendered by him during the period when heavy floods were anticipated.

M. U. BARAKZAI, •

Agriculturist,
Agricultural Research Station, Sakrand (Sind).

ANNUAL REPORT OF THE BOTANICAL WORK IN SIND UNDER
THE BOTANIST, AGRICULTURAL RESEARCH STATION,
SAKRAND, FOR THE YEAR 1929-30

Organisation.—I held charge of the Botanical Section at Sakrand throughout the year and in addition controlled the Botanical work of the Sind Department proper. The staff at Sakrand consists of one Cotton Breeder in the Provincial service, one Cotton Assistant, one Jowar Assistant and one Wheat Assistant in the cadre of Graduate Assistants. The staff outside Sakrand consists of two Graduate Assistants; one is stationed at Larkana to control the rice breeding work at the Station and in addition Bosi wheat breeding work at Jacobabad and the other is posted at the Seed Farm, Mirpurkhas, in connection with the maintenance of established strains of cotton and seed supply scheme of 27 W.N.

I. Cotton

Future cotton of Sind.—The field scale trials carried out from year to year have shown that Punjab American cottons maintain first rank in point of hardiness and yield among all the American and Egyptian cottons tried in Sind. We now have, in these cottons, improved strains possessing a fairly good staple, good ginning outturn and high yield awaiting multiplication and distribution for Barrage conditions. On the other hand we have material in hand among the Sea Island, Egyptian and American cottons of excellent quality, requiring further acclimatisation and improvement in yielding capacity.

Field trials of varieties and sowing date experiments.—This is the second year of this experiment. The results obtained during the season are almost identical with those of last year as shown below :—

Date of sowing	Mean yield of seed cotton in lbs. per acre					
	27 W.N.	Punjab American		Egyptian Ashmoni	Imported American	
		4F	285F		Acala	Hartsville
23 April	2,094	1,939	1,828	1,032	1,139	..
12 May	1,940	1,568	1,496	1,110	947	710
17 June	708	714	568	469	213	213
Average	1,580	1,407	1,297	870	763	461
Yield ratio	2.0	1.8	1.7	1.1	1.0	..

There were six replications in April and May sowings and four in June sowings. It will be seen that the Punjab American cottons are at present capable of yielding almost twice as much as our best varieties in imported American and Egyptian cottons. It will be further noticed that mid June sowings in an year of heavy rainfall are not at all profitable and that late April sowings give a much higher yield than mid May sowings. Two

promising American cottons recently imported, viz. Acala and Hartsville were tested in alternate strips replicated five times. Acala yielded at the rate of 994 lbs. per acre and Hartsville 860 lbs.

Field experiments.—Soil in Sind varies considerably. It is not uncommon to find a fertility slope in one direction and strong fluctuations in the other. Under such circumstances the plan of field experiments should receive great attention. During the last two seasons various arrangements of plots, different sizes of plots and different number of replications have been tried. The results were sent to Rothamstead Field Experiment Department for criticism and suggestions. The following tentative conclusions have been drawn :—

1. The size of a single plot should not be more than $1/40$ acre.
2. The number of replications should be six or more.
3. The arrangement of plots should be according to either of the methods devised by Fisher, viz. Latin Square method and Randomised Block system.
4. Any of the replications showing abnormal results may be dropped.

Improvement by selection.—The following table will show the economic characters of some of the promising strains bred for Barrage conditions :—

Strain No.	Staple length in m.m.	Ginning per cent.	Yield per plant in grams	Remarks
1. 4F-18 ..	20·0	34·0	195·3	Established strain.
2. 4F-98 ..	23·3	34·2	193·0	1st year of field trial.
3. 285F-21 ..	27·2	29·3	164·0	Do.
4. 285F-30 ..	25·5	31·0	84·7	Do.
5. Acala 27 ..	29·5	34·0	74·0	Do.
6. Acala 35 ..	30·0	32·0	65·0	Do.
7. Hartsville 111 ..	32·0	29·0	50·0	Do.
8. Ashmoni 37 ..	29·9	34·6	213·8*	Do.
9. Ashmoni 14 ..	30·0	32·0	168·0*	Do.
10. Boss III 16 ..	34·6	32·0	150·0*	Do.
11. Boss III 18 ..	28·8	34·0	165·0*	Do.
12. Sea Island 2-4 ..	39·0	27·4	138·0*	Do.

*These strains marked with asterisk are badly affected by white ants consequently the yield per acre is low but the single plant yield stands high. Two strains are worthy of special mention. 4F-98 is an improvement over 4F-18 in having a longer staple, and it can be grown under all conditions of soil and climate. Sea Island strain No. 2 has a staple of one inch and a half. This strain seems to stand the climate fairly well and may prove to be a profitable crop on well conducted estates in East and Central Sind.

Improvement by hybridisation.—Two segregates from 285F-1 × Sea Island cross, viz. 168 and 192 were grown in F5 generation in 8 single plant cultures, four of each. One of these lines, viz. 192-10/12-8 seems to be promising as it showed considerable uniformity in almost all characters. It is a fairly good yielder, has good staple and fair ginning

percentage. It is also early and stands well. One segregate from 285F-1 $\times$ Pima cross was grown in five single plant cultures in F₅ generation but none of them showed uniformity. 4F-18 $\times$ Meade cross was grown in F₂ generation. This cross did not show any abnormality or sterility as was noticed in 285F $\times$ Sea Island and 285F $\times$ Pima crosses. Out of 130 F₂ plants, 31 plants have been grown in the current year to raise F₃ generation. Inheritance of characters in F₂ generation has been recorded.

Maintenance of established strains.—The cotton plots at the Seed Farm, Mirpurkhas, in connection with the seed supply scheme of 27 W.N. were all destroyed by floods. This danger had been foreseen in 1927 when the crop had also been destroyed and the work was partially duplicated at Sakrand. Hence it has been possible to feed the seed Farm with pure seed during the current season and to carry on the seed multiplication scheme of 27 W.N. without interruption.

Incidence of disease.—During the season, the white ant attack among the Egyptian and American cottons continued. There were some deaths due to a species of root rot which caused wilting of plants. This fungus has not yet been identified. There were repeated attacks of locusts during the season but the damage was not great. The bollworm trouble during the season under report was considerably less than in the preceding year.

II. Wheat

AGRONOMIC INVESTIGATIONS

(a) *Effective sowing season and optimum seed rate experiments with C.Ph. 47.*—These experiments were carried out in plots which subsequently showed considerable soil variation; the results are given in the following table:—

Date of sowing	Yield of grain and straw in lbs. per plot. Average of 3 replications			
	80 lbs.	Seed rate	40 lbs.	Seed rate
	Grain	Straw	Grain	Straw
26th October 1929	81.6	224.3	85.0	191.6
30th November 1929	78.3	233.3	75.0	217.3
26th November 1929	88.3	230.0	80.0	221.8
30th November 1929	83.5	260.0	78.5	224.6

It will be noticed that even in a year free from frost the late October sowing did not give higher yields than late November sowings. Both the crops were harvested at the same time, i.e. early April. As regards the optimum seed rate there are some indications in favour of 80 lbs. seed rate per acre.

(b) *Suitable date of utilizing canal water.*—The Sind wheats cannot be sown earlier than the last week of November owing to fear of damage by frost. Consequently experiments were started in 1928-29 to determine if the flooding of wheat land could be done in October and water conserved in the soil till sowing time. A set of two plots were flooded on 25th October with a dose of five inches irrigation water, another dose of three inches was applied just before sowing, i.e. on 14th November. Another set of two plots were flooded with the full 8 inches dose just before sowing as is usually done. Subsequent treatment remained the same. The early flooded plots yielded on an average at the rate of 2,280 lbs. per acre as against 2,392 lbs. in the case of normally flooded plots. These results require to be confirmed. If the decrease due to early flooding proves to be significant, attention will have to be diverted to finding out a type of wheat which would stand sowing in late October with advantage.

(c) *Variety trials.*—Five varieties were tested in six replications arranged according to randomised block system. The following results were obtained :—

Variety	Plot yield in lbs. grain	Calculated yield in lbs. per acre	
		Grain	Straw
C.Ph. 47	100.0 $\pm$ 3.9	2,904.0	6,982
Punjab 8A	93.1 $\pm$ 3.1	2,705.6	8,363
Punjab 11	84.1 $\pm$ 1.6	2,442.2	8,218
Pusa 12	75.5 $\pm$ 2.5	2,198.5	6,446
G.S. 25	75.0 $\pm$ 4.5	2,119.5	6,982

Note.—G.S. 25 lodged badly.

The selected Sind strain C.Ph. 47 has maintained first rank and has out-yielded Pusa 12 by about 33 per cent. These results have been confirmed in another set of carefully conducted experiments in the Chemical section.

(d) *Acclimatisation and adaptation.*—Several varieties of wheats from different parts of India, Australia, Canada and United States were tried.

Pusa wheats.—Of the 9 prominent Pusa wheats none was found to be equal in yield to the selected Sind strain C.Ph. 47. Pusa 12, Pusa 111 and Pusa 114 did fairly well.

Punjab wheats.—Of the three varieties, viz. Punjab 8A, Punjab 8B and Punjab 9 tested during the season, Punjab 8A seems to be promising and may be suitable for East Sind as it is an awned wheat.

Bina wheat.—This wheat was obtained from North-West Frontier Province where it was originally imported from Australia. It has a long growing period and requires to be sown in late October. This wheat flowers in the second week of February when the danger of frost has passed. The October sown plot yielded at the rate of 2,240 lbs. of grain per acre. It has a good quality of grain and consequently should have a great future in Sind.

Manitoba wheat.—This is the second year of trial of this wheat at Sakrand. It has a long growing period and requires to be sown a month earlier than the normal sowing date. A small plot yielded at the rate of 1,280 lbs. of grain per acre. The quality of grain is excellent. This is world famous wheat and has been utilized in improving the quality of our selected Sind wheats by hybridisation.

Australian wheats.—Several wheats from different parts of Australia, viz. Victoria (Melbourne), South Australia (Roseworthy) and New South Wales (Cowra and Sydney) were obtained. Of the 43 varieties tested the following varieties were found to be promising in point of yield of grain:—(1) Rani; (2) Caliph; (3) Sultan; (4) Bobin; (5) Lana; (6) Federation. These varieties took 145 days to ripen and yielded at the rate of 2 lbs. per row (1/1280 acre).

American spring wheats.—Five varieties of spring wheats, viz. Marquillo Ceres, Reward, Garnet and 1658·118 were obtained from Dr. Waldron of North Dakota. These wheats took a very long period (145-157 days) to ripen under Sind conditions, whereas they take about 90 days in U.S.A. They also did not yield well. A large collection of white and red spring wheats was also obtained from the Washington Bureau of Plant Industry. All of these wheats ripened late but the white spring wheats were mostly earlier types; the red spring wheats did not attain full maturity under Sind conditions. None of them appeared to be so prolific as the selected Sind strains. Reward, Garnet and Ceres seem to be more promising.

American winter wheats.—Thirty-four varieties of winter wheats from Kansas were tried. They showed a peculiar habit of growth more like creeping or spreading plants. They did not produce any heads except in the case of one or two varieties in which the spikes were forced out without any formation of grain.

Canadian spring wheats.—Four varieties, viz. Prelude, Garnet, Ruby and Marquis were tried. The first two did well and matured in 140 days.

Botanical Investigations

Improvement by selection.—Three selected strains of Sind wheats, viz. C.Ph. 47, A.T. 38 and G.S. 25 have now been established. Selection from bulk samples has however been continued from year to year. Of a large number of new selections under trial, the following show great promise in point of yield, quality and strength of straw.

Strain No.	Average yield per plant in grams	
	Strain	Standard C.Ph. 47
H.S.W. III	49·3	31·5
888.E.Ph.W.	30·3	20·8
G.S.W.	40·9	20·8

These will be tested in the current season on field scale.

Improvement by hybridisation.—F₂ generation of Pusa 12 crosses with selected Sind wheats, viz. C.Ph. 47 and A.T. 38 was grown during the season. The results have not been worked up till now. F₁ generation of Manitoba crosses with C.Ph. 47 and Pusa 12 was also grown during the season. The F₁ hybrid possessed the prolificness of Sind wheats combined with the good quality of grain of Manitoba.

Milling and baking tests.—These have been carried out in collaboration with the Imperial Economic Botanist, Pusa, and the following wheats grown at Mirpurkhas have been sent to the Research Association of the British Flour Millers, London, for milling and baking tests:—

- | | | | |
|---------------|-------------|-------------|-------------------|
| 1. Pusa 4 | 4. Pusa 52 | 7. C.Ph. 47 | 10. Choice white |
| 2. Pusa 12 | 5. Pusa 111 | 8. A.T. 38 | Karachi (Trade |
| 3. Pusa 80-57 | 6. Pusa 114 | 9. G.S. 25 | sample, Karachi). |

The abovementioned Pusa wheats grown at Pusa have also been sent by the Imperial Economic Botanist, Pusa, for milling and baking tests to see the effect of environment on quality.

Incidence of disease.—Heavy dew fell on 19th and 20th March and was followed by cloudy weather. This resulted in the appearance of rust in low-lying beds which had been given the last watering at the same time. The stem and leaves were mostly affected and in some cases glumes also showed discolouration. The grain however was not so affected except in the case of Bansi and other Durum wheats.

III. Jowar

Improvement by selection.—We have six improved strains of promising Jowar varieties. These are:—(1) Saoro Kartuho strain No. 1; (2) Bagdar No. 1; (3) Allakh No. 2; (4) Red Janapur No. 3; (5) Acho Kartuho No. 1; (6) Acho Bazigar No. 1. Further selection from village samples is made from year to year and we had about forty-one new strains under test. Of these, eleven strains have been retained for further trial. The following three strains were found to be the best among all the new selections:—

Strain No.	Yield of grain in lbs. per plot (5 rows)		Yield per plant in grams	
	Strain	Standard S.K. No. 1	Strain	Standard S.K. No. 1
Depar No. 1	36.0	21.5	71.5	43.5
Depar No. 2	34.5	21.5	63.8	43.5
Acho Kodri No. 25	26.0	22.2	56.2	47.4

Improvement by acclimatisation.—Four varieties of American Sorghums, viz. (1) Spur Feteritta, (2) Yello Milo, (3) Kaffir standard black hull 6022, (4) Kaffir black hull 9295, obtained from College

Station Texas, were tested with the standard Saoro Kartuhio No. 1. The first two varieties were found to give a higher yield than the standard Saoro Kartuhio and these have now been tested in replications during the current season. The American Sorghums are not so tall as the Sind Jowars. Spur Ferteritta and Yellow Milo have a much higher tillering capacity than the Sind Jowars. All of them ripen along with Sind Jowars.

Improvement by hybridisation.—The three crosses reported last year were grown in F₂ generation. The following table will show the number of plants under study and the yield of the best F₂ segregates :—

Cross	No. of plants in F ₂ generation	No. of plants retained for F ₃ generation	Maximum single plant in grams	
			Best F ₂ segregate	High yielding parent
Torh × Bagdar ..	1,780	100	242·12	138·0
Torh × Acho Kodri ..	1,483	60	182·12	72·0
Torh × Allakh ..	319	50	184·00	110·0

Inheritance of certain characters has been recorded.

Variety trials.—The following varieties were tested in six replications arranged according to "Randomised Block" system. The results are given below :—

No.	Variety	Yield of grain in lbs.	
		per plot (1/40 acre)	per acre
1	Bagdar No. 1 ..	39·37 ± 2·4	1,574·8
2	Saoro Kartuhio No. 1 ..	34·81 ± 3·2	1,392·4
3	Red Janapur No. 3 ..	37·33 ± 2·6	1,493·2
4	Acho Kartuhio No. 1 ..	26·56 ± 1·3	1,062·4
5	Allakh No. 2 ..	23·94 ± 1·6	957·7
6	Sakrand local ..	41·00 ± 1·1	1,640·0

Study of hereditary characters and classification.—Sixty-two varieties of Sind Jowars have been fully classified and described.

IV. Rice

The Rice Breeding work is being conducted at Larkana. Three selected strains have been established. They are :—Kangni 27 ; Jajai 77 and Prong 36. Under present conditions of water supply, Kangni 27 seems to be the most profitable rice. This strain is being multiplied on a large scale according to a fixed seed supply scheme.

Further improvement by selection.—Ten new strains were tested in replications with Kangni 27. None of them seems to be equal in yielding capacity as Kangni 27 with the exception of one strain Kangni No. 119 which requires further testing. It seems there is no scope of further improvement by selection.

Improvement by hybridisation.—This is now the most important line of work in producing further improvement over our selected material. F2 generation of the following crosses was grown during the year:—

1. Kangni 27 × Kolumba 184.
2. Kangni 27 × Torh.

The Kangni × Kolumba cross seems to be most promising; it has resulted in the production of F2 plants having an exceptionally high yielding capacity and good quality of grain. The object of this cross was to increase the number of grains in the Kangni 27 earhead and thereby to increase yield. Fifty plants possessing the desirable characters of both parents have been selected out of a F2 population of 3,351 individuals. All of them possess a very large number of grains, which are as heavy in weight as Kangni, the single plant yield having been increased by more than 50 per cent.

The Kangni × Torh cross was made with the idea of increasing the tillering capacity of Kangni 27 but F2 generation showed that a large number of the plants had the habit of Torh and the increase in single plant yield was not adequate in the plants free from shattering habit. The inheritance of certain characters in F2 generation has also been studied during the year.

Maintenance of rices with special characters.—The earliest maturing rices of Sind are Sighro and red Kangro. The former ripened during this season in 93 days and latter 91 days. Sighro gave higher yield than red Kangro. Torh continued to maintain its high character of profuse tillering and on an average produced 32 tillers per plant. Basmati and Bengalo rices represent the pick of the scented rices tried at Larkana. Bengalo is a much higher yielding type with a good future under Barrage conditions. New type Y is a low quality rice with red colour and is being maintained for the high yield of single plant as also heavy weight of grain. Basant Bahar from Assam is being maintained as a fine grain variety.

Trial of foreign rices.—Eleven varieties of Kashmere were tried. They showed poor tillering and most of them were early ripening taking about 70 days. K.D. No. 15 seems to be most high yielding among the varieties tested. Eight varieties of Punjab rices were tested. They are early to medium ripeners; none of them seems to possess high yielding capacity. Kamod rices from Gujarat were also tested; they took about 135 days to ripen but in point of yield they are much below standard Sind varieties. Three strains of Ratnagiri rices were tested; they took about 108-116 days to ripen. Ratnagiri strain No 61 appeared to be a good yielder. Bara rice from Peshawar, Basmati from Deradun

and an acclimatised Bengal rice "Bengalo" are the best foreign rices suited to Sind conditions.

Seed supply scheme.—The seed supply scheme of Kangni 27 consists of (a) Selfing patch of about a guntha ($1/40$ acre) grown from selfed seed, (b) Seed patch of half an acre, (c) Farm area consisting of about 20 acres, (d) Departmental zamindari area of 400 acres. So far it has not been possible to collect the entire produce of zamindari area for seed distribution consequently the seed supply scheme is awaiting expansion. Similar schemes are in hand for Jajai 77 and Prong 36 but the Farm area under these strains is about 4 acres each. These strains are likely to have a great future under Barrage conditions.

K. I. THADANI,

Botanist,

Agricultural Research Station, Sakrand (Sind).

ANNUAL REPORT OF THE WORK DONE UNDER THE AGRICULTURAL
CHEMIST AND SOIL PHYSICIST, AGRICULTURAL RESEARCH
STATION, SAKRAND, FOR THE YEAR 1929-30

I continued to hold charge of the post of the Agricultural Chemist and Soil Physicist throughout the year under report. Mr. Daji, my senior assistant, left for England in June 1929 for advanced studies and his place was taken by Dr. P. G. Krishna in July. Mr. H. A. Idani, my Second Assistant, is transferred to the Botanical Branch for which he had a special liking and his place is taken by Mr. J. J. Chandnani. Mr. Mulvani has continued as junior Assistant.

The work of the Section mostly pertains to research on soils kalar or alkali land, their réclamation, fertility, water-requirements of crops, etc.

The deep alluvial soils of Sind vary very much in their character from place to place. Further tests of the soils at different spots on the Farm showed that the pH value of the soil free from any soluble salts, was about 7.5 as against 8.5 to 9.2 found on spots affected by kalar or salts in varying degree. Failure of crops on such soils as show a pH value of 9.2 and above may be ascribed to the greater alkaline reaction of the soil but a similar failure of crops on land having a pH value of 7.2 and containing very little or inappreciable quantity of soluble salts indicated that the cause of barrenness may lie in bad physical texture of the soil and want of plant food or bad cultural treatment. Instances have been met with on the Farm area where crops are showing distinct signs of failure on spots which only a year or two ago used to give very good crops. The various tests, both physical and chemical, applied to such areas showed that the cause may be ascribed to the drain on potash and phosphoric acid of the soil which have been appreciably lowered by repeated growth of wheat and jowar on the area. By this drain on the total potash and phosphoric acid contents of the soil, the available portions of these fertility constituents are likely to be reduced to a minimum. Strangely enough the nitrogen contents have not been lowered down to any appreciable degree. This state of affairs is found on an area which is being specially standardized for the trials of artificial manures under fertility experiments described below.

Physical examination of these soils show that repeated irrigations have a tendency to make the upper surface soil more clayey and stiffer and the lower layers more sandy. This is because when the soil is well ploughed and irrigated, the heavier particles sink down leaving clay particles to settle on the surface. Such a process carried on from year to year is likely to render the surface soil unsuitable as a seed bed for germination, for which a loamy or sandy texture is more suitable. It appears therefore desirable that lands under irrigation should be occasionally ploughed with a turnwrest plough so as to mix the lower layer of the soil with the surface soil.

Soil Fertility.—In order to see whether the fertility of the soil will be maintained or whether the soil will be depleted of its fertility constituents

under Barrage conditions, land under two systems of cropping is kept under observation; one of these systems is that proposed in the Barrage Project and is called the "Project System" and the other is one which is proposed as an alternative to the Project System called "Sakrand D System" which is aimed at maintaining the fertility of the soil by a suitable rotation and by growing Berseem as a subsidiary crop. One year's analytical results do not show any material difference in the fertility constituents but indications are in favour of Sakrand D System. The test must be continued for several years when only a true comparison can be made.

In another area of the Farm consisting of about 8 acres of land, wheat and jowar are being taken one after another in the rabi and the kharif season without giving any rest to the land. The object is to remove as much of the fertility constituents as possible by continuous cropping and by exhausting the soil and then to apply artificial manure so that the effect of the artificial manures should be marked at once. The following table shows the changes in the fertility constituents that took place in the year during which one crop of Jowar and one of wheat was taken out.

1929		1930	
(Before Sowing Jowar) Soil 0-12"		(After one crop of Jowar and one of wheat was taken) Soil 0-12"	
		Per cent.	Per cent.
Nitrogen	.. ..	0·09	0·09
Potash	.. ..	0·79	0·68
Phosphoric Acid	.. ..	0·13	0·09

It will be seen from the above figures that whereas potash and phosphoric acid have been appreciably removed by the crops there has been no change in the nitrogen contents of the soil. This does not mean, however, that the crop has utilised no nitrogen from the soil but it indicates that the soil has good power of recouping its nitrogen contents by fixing nitrogen from the atmosphere.

Nitrogen Fixation Power of the Soil.—In order to test the nitrogen fixation power of the soil, a definite quantity of the soil was incubated in the flask with 20 per cent. of water at Laboratory temperature for three weeks and the nitrogen contents determined from week to week. As the soils in Sind are generally deficient in organic matter, a similar flask containing the same quantity of the soil and two grammes of mannite (to supply energy in the form of an easily assimilable organic matter free from nitrogen) and 20 per cent. water was also incubated under identical conditions.

Another set containing silt (consisting of very fine sand) was similarly incubated for comparison.

It was found at the end of the experiment that the soil to which mannite was added had fixed 0·025 per cent. of nitrogen from the air whereas the soil to which no mannite was added did not fix any nitrogen. The silt in either case, i.e., with and without mannite did not fix any nitrogen.

This shows that if the soil is supplied with sufficient organic matter and moisture it is capable of fixing an appreciable amount of nitrogen from the air but without organic matter it is incapable of fixing any nitrogen. The silt probably had no nitrogen fixing bacteria or had not sufficient other plant food readily available to activate the nitrogen fixing bacteria. The test will be continued in more details.

The above experiment indicates a great possibility for the use of such organic manures as compost and oil cakes. The practical difficulty that may arise in the use of these manures and especially the former is the trouble from white ants which will have to be overcome.

Kalar or Salt land.—Kalar or salt land, as has been previously reported, contains from 0.5 to as much as 8 and 11.0 per cent. of soluble salts. Such extreme cases are however very few. The injurious salts commonly present are the chloride and sulphate of sodium. Sodium carbonate, which is the worst kind of salt, is found only in traces. In some places magnesium chloride is found in appreciable quantity and it is suspected that magnesium chloride is more harmful than it is generally supposed to be. The investigation is in hand but as it is yet in a preliminary state it is too early to draw any definite conclusions.

The nitrogen fixation power of kalar land is much less than that of a good land free from salts. Here again a very small quantity of sodium carbonate (0.02 per cent.) is found to be more harmful on the activity of the nitrogen fixing organisms than a much larger quantity (about 1.0 per cent.) of sodium chloride and sodium sulphate. The want of nitrogen fixation power in the kalar land and the beneficial effect of calcium salts on them (such as CaCl_2 and CaSO_4) indicate that nitrogen in the form of calcium nitrate or calcium cyanamide as a top dressing along with a bulky organic manure like compost or oil cake would be advantageous on kalar lands after the salts are leached out.

Reclamation Experiments.—These are being tried in two ways (a) by leaching the salts down into the soil by flooding with different quantities of water, and (b) by the application of such chemicals as calcium chloride. Comparative laboratory experiments are also being tried with calcium sulphate, lime, etc.

(a) The minimum dose for leaching salts down so as to secure a fairly good germination on friable soils has been found to be about 12 acre inches, though 16 and 20 acre inches have given better results. Such initial doses, with subsequent waterings of 4 acre inches given every 12 to 15 days for cotton, jowar and bajri, etc., have given normal yields in soils containing up to 2-3 per cent. of soluble salts.

It has been found that a smaller dose of water given at a shorter interval is more effective in checking the rise of salts in the upper surface of soil than bigger dose of water given at longer intervals, e.g., a 3 acre inch dose given at an interval of ten days is more effective than a dose of $4\frac{1}{2}$ acre inches given at an interval of fifteen days. Besides it is desirable that a dilution of the soil solution should take place before

it reaches a higher concentration, and thus affects adversely the osmosis of the root cells.

In the process of leaching down the injurious salts, sodium chloride is more readily washed down than sodium sulphate. Sodium chloride is known to be more harmful than sodium sulphate but, by the leaching process, it is possible to wash down a greater portion of sodium chloride and lessen the toxic effect of the salt. This explains why sometimes kalar land containing more of sodium chloride can be more easily brought under cultivation.

(b) Application of calcium chloride for the leaching of salts has given encouraging results in the very first year of its use on a very bad strip of kalar land. The germination of cotton seed was found to be almost normal where calcium chloride was applied whereas there was no germination on the portion untreated with calcium chloride. The cost of the chemical is however prohibitive. One ton of this chemical, which is required for one acre of bad "kalar" land, costs as much as Rs. 100. The application is however to be given once in three years. In practice it may be possible to treat only small patches of bad kalar land scattered here and there in the field by this method.

In the laboratory experiments it has been found that an addition of calcium sulphate to the soil renders it more porous and allows water to percolate more freely through the soil. Calcium sulphate is also much cheaper than calcium chloride. Field experiments will therefore be undertaken.

Tolerance of salts by various crops.—Pot culture experiments are in hand to find out the toxic limit of salts or the limit up to which different salts, usually found in salt lands, can be tolerated by the various farm crops.

In case of wheat, 0.3 per cent. of sodium chloride was found to be harmful in the soil. The seed germinated but the seedlings died within a few weeks. Sodium sulphate was found to be less harmful, and was tolerated up to 0.5 per cent., a mixture of sodium chloride and sodium sulphate was found to be less harmful than either of the two salts separately.

In the field, in actual practice, crops are found to stand higher quantities of soluble salts owing to the presence of a mixture of salts. The precise nature of this ameliorating action or the "antagonism" between the ions of different salts is not yet fully known. Jambho (*Eruca Sativa*) and castor were found to be more resistant to kalar. Jambho is a *rabi* crop and castor is a *kharif* crop. Both these crops require comparatively less water than other *rabi* and *kharif* crops and can with advantage be grown on freshly reclaimed soils in the process of reclamation.

Water requirements of crops.—The object of these experiments is to find out by giving accurately measured quantities of water, the normal quantity of water required for different crops and to determine the transpiration ratio of the several crops under field conditions to

find out the quantity of water actually used by the crop for its growth. In the previous year it was found that a quantity of water equivalent to 30 acre inches was just enough to give a normal yield of cotton; During the year under report as much as 20 inches of rain fell from July to September (as compared to 2 inches in the previous year) with such heavy showers at times that the plots were flooded with water which had sometimes to be drained away for fear of breaking the bunds or over-flowing. No accurate measurements of water could therefore be maintained but on the whole the crop of cotton grew very luxuriantly and gave as high a yield of seed cotton as 25-30 maunds as against 10 to 12 maunds obtainable under normal conditions.

In the *rabi* season the two promising varieties of wheat, viz., Pusa 12 and Phandani C.Ph. 47, that are likely to be grown under the post Barrage conditions, were tried with different quantities of water, the result is tabulated below :—

Variety grown	Total quantity of water given in acre inches	Total number of days from the date of soaking to the last watering	Duty obtained	Average calculated yield per acre in grains
Pusa 12 ..	16.5	120	175	lbs. 2,641
Phandani (C.Ph. 47) ..	16.5	120	175	3,165
Pusa 12	14.4	120	200	2,557
C.Ph. 47 ..	14.4	120	200	2,896
Pusa 12 ..	12.8	120	225	2,115
C.Ph. 47 ..	12.8	120	225	2,652

It will be seen from above that Phandani (C.Ph. 47) gave as much yield with 12.8 acre inches of water as Pusa 12 would give with 16.5 acre inches of water. It is also clear from the table that, given the same quantity of water and the same cultural treatment, C.Ph. 47 is capable of giving more yield than Pusa 12. Analyses of grain showed that the Nitrogen contents of Pusa 12 were 2.5 per cent. whereas those of Phandani were 2.3 per cent. showing that in protein contents Phandani wheat compares favourably with Pusa 12 wheat.

Experiments carried on to see the effect of conserving water, applied at different times from October onwards up to the sowing time of wheat in late November, did not show any marked results in the yield of wheat. Plots which received early water in October gave as much yield as plots which received water late in November. On an average the calculated yield per acre was about 2,000 lbs. of wheat grain in all the plots.

Fertility Value of the River Silt.—At the suggestion of Mr. C. S. C. Harrison, Chief Engineer, Lloyd Barrage, the work of investigating the fertility

value of the Indus silt was taken in hand as it was found by Dr. Taylor in Egypt that the silt of the Nile had no fertility value.

The following table shows the amount of plant food constituents found in the suspended as well as the deposited silt at different places on the bank of the Indus :—

	Nitrogen	Potash K2O	Phosphoric Acid P2O5
	Per cent.	Per cent.	Per cent.
Suspended silt from the Indus water at—			
1. Rohri	0·049	0·360	0·197
2. Pad Idan	0·380*	0·524	0·135
3. Kot Laloo	0·380*	0·468	0·055
4. Sann	0·198	0·248	0·212
5. Pura Dhoru	0·114	0·952	0·135
Deposited silt from—			
1. Rohri	0·013	0·124	0·225
2. Kot-Laloo	0·027	0·120	0·245
3. Pura Dhoru	0·039	0·284	0·215

It will be seen from the above table that the suspended silt in the Canal water is quite rich in nitrogen and potash ; the deposited silt, however, is poor in nitrogen, though it contains a fairly good amount of potash and phosphoric acid.

For want of time and funds the work could not be carried out in further details.

Sub-soil water level and water logging.—In order to see if, under post Barrage conditions, the sub-soil water level of the country will gradually rise to such an extent as to cause water logging or be otherwise harmful to the proper growth of the crops, a series of bore holes are sunk across the Farm-area and the water level in them kept under observation from month to month. The general water level in the bore holes is about 30 feet below the ground level during the dry season of the year, i.e., about May and June and about 26 to 28 feet during the inundation season. Owing to the high floods, however, during the year under report, the Farm area was surrounded by water and the water level in the bore holes rose by about 9 to 10 feet during September-October 1929 and fell only by about 1 foot during the dry months, viz., May-June 1930, so that a rise of about 8 feet is still maintained and the general water level is now about 20-22 feet below ground level in the dry season. The observations will be continued to see if the water level will gradually go down to its original depth or will be maintained at a permanently higher level.

The highest capillary power of soils and sub-soils, so far examined, was 8 feet, hence so long as the sub-soil water table remains 10 to 15 feet below ground level there is no danger to the crops.

Examining sites for demonstration Farms.—During the year under report about ten sites selected by the Deputy Director of Agriculture

*Doubtful samples.

for new Demonstration Farms in different parts of Sind were examined for their salt contents and suitability for cultivation. The total number of soil samples examined was about 1,200.

It was noteworthy that among the sites examined, those from Central Sind on the left bank of the Indus did not show any appreciable quantity of sodium carbonate, the chief injurious salts present being sodium sulphate and sodium chloride. On the right bank, however, almost all the soils selected excepting the Belati site (in Larkana District) contained from traces to appreciable quantities of sodium carbonate in addition to sodium sulphate and sodium chloride.

• Out of the three sites selected in the Thar Parkar District, one showed an appreciable amount of sodium carbonate although the total soluble salts in these sites were much less than in those on the right and the left bank of the Indus.

Miscellaneous.—About 200 samples of soils were received during the year under report from several Executive Engineers for analyses to find out salt contents and suitability for making bricks.

• Several zamindars also sent a number of soil samples for examining the fertility constituents and the salt contents.

Staff.—All the members of my staff have worked satisfactorily throughout the year. The extra work of examining of about 1,400 samples of soils from the sites for the demonstration Farms and the miscellaneous samples from the Executive Engineers put a great strain on the staff who rose to the occasion and put in the extra work necessary to complete the analyses.

V. A. TAMHANE,

Agricultural Chemist and Soil Physicist
in charge Agricultural Research Station, Sakrand, Sind.

APPENDIX U

**SUMMARY OF WORK OF AGRICULTURAL PROPAGANDA IN NORTH AND
MIDDLE SIND, UNDER THE DEPUTY REGISTRAR, CO-OPERATIVE
SOCIETIES, SIND, FOR THE YEAR 1929-30**

In addition to my duties as Deputy Registrar of Co-operative Societies in Sind, I held charge of the office of the Agricultural Propaganda Officer throughout the year, except for a brief period of three months and nine days (22nd July to 31st October) during which I had proceeded on leave. Mr. S. Jafferli Ansari was in charge of the Propaganda work during the period of my absence on leave.

The area of my activities continued to be the same as last year, viz., the undermentioned eleven Talukas :—

North Sind—(1) Ghotki, (2) Sukkur, (3) Mirpur Mathelo,
(4) Shikarpur, (5) Larkana, (6) Kambar.

Middle Sind—(1) Hyderabad, (2) Halla, (3) Tando Allahyar,
(4) Shahdadpur, (5) Matli.

Propaganda Staff

The numerical strength of the Agricultural Propaganda staff also remained the same as last year, viz., two Agricultural Inspectors and five Overseers. Mr. Jafferli Ansari, Agricultural Inspector, North Sind, however proceeded on leave on Medical Certificate with effect from the 24th December to 16th May last, and during his absence Mr. Mahomed Parial, District Agricultural Overseer, Shikarpur, was put in charge of the work in addition to his own duties.

Inundation and Season

The year under report was from the agricultural point of view, one of the most unfavourable ones. The cultivation season opened with rather gloomy prospects inasmuch as even up to the middle of July, the Indus at Bukkur did not attain a fair irrigational level. The important Kharif crops, viz. rice in North Sind and cotton in Middle Sind, were therefore considerably delayed. The late inundation particularly affected the Sugdasi variety of rice as the seedlings had got deteriorated by overstay in the beds. Such areas had therefore to be cultivated with non-Sugdasi varieties. In Middle Sind again the plots prepared and manured for cotton had to be cultivated with bajri and other dry crops owing to late inundation. But whatever little of early cotton cultivation had been effected, was washed away by the heavy downpour of rain which came in about the third week of July. The 2nd and the 3rd instalments of rains, the floods caused by the bursting of the Shyok Dam washed away almost every kind of cultivation particularly in the districts Hyderabad, Thar Parkar and Nawabshah. The rice areas in Larkana and Karachi Districts however were mostly saved. The heavy rains and floods caused

much loss of live stock and property, though there was very little loss of human life, owing to the vigilant measures adopted by Government. Shortly afterwards however there followed widespread cholera, malaria and influenza which played great havoc to human life throughout the province. Nature had yet another calamity in store for the agriculturists and swarms of locusts hovered over the length and breadth of the country eating away the crops wherever they settled. The frost wave of December again considerably damaged the cotton crops that had survived the floods and the locust attacks.

Whatever little of Kharif crops was saved from the above mentioned calamities fetched very low prices owing to a dead slump in the market.

The extensive floods had opened however a very wide field for *rabi* operations and as a matter of fact the yield from that crop has been fairly plentiful. It is a pity however that the prices of wheat also at this time are ruling very low and in some places it is found that the crop does not yield as much in value as the cost of the seed sown.

The agriculturists have thus witnessed neither a prosperous nor a healthy year.

Crop pests and diseases

Grass-hoppers attacking rice crops were reported from Larkana, Kambar and Shikarpur Talukas. The Jowar crops throughout North Sind were attacked by the stem-borer and mostly the late crop was seriously affected thereby. In Middle Sind the boll worm attacked the cotton crop and caused considerable damage to it.

Fodder

There was a little scarcity of fodder in the beginning of the season but shortly after the rains, there was abundance of verdant fodder available everywhere.

Agricultural labour

On the whole there was sufficient labour available although wages ruled rather higher for about three months of the *rabi* season.

Activities undertaken during the year

During the year the usual programme of agricultural propaganda work was carried on and the activities undertaken are summarized in the following paragraphs :—

I.—Popularization and distribution of selected varieties of seeds

(a) *N.R. Cotton Seed*.—Of the Desi varieties of cotton, N.R. is appreciated most; both by the agriculturists and the factory owners. The former appreciate it on account of its heavier yield and the higher price it fetches in the market over other Desi varieties, while the latter pay a premium on it on account of the greater percentage of lint that it

yields. The usual arrangements for securing this seed were made in Middle Sind and the following quantities distributed through the agency of the respective Taluka Development Associations :—

				Maunds
Hyderabad	..	..	..	600
Matli	..	..	..	200
Tando Allahyar	..	..	..	600
Halla	..	..	..	195
Shahdadpur	..	..	..	50
Total ..				1,645

The late inundation and the subsequent misfortunes referred to above, affected the cotton crops very severely, and the results achieved were therefore poor.

(b) *Wheat seeds*.—During the *rabi* season of the year under report

Pusa 12	34,800 lbs. purchased from Grain Sale Society	62,767 lbs.
Do.	14,035 lbs. purchased from Jacobabad Farm	of the mar-
Phundni C.P.H.47	3,485 lbs. purchased from Larkana Farm	ginally noted
Thori A.T.-38	10,447 lbs. purchased from Jacobabad Farm	wheat seeds
	62,767	were distri-
		buted to 17

progressive zamindars of North Sind under the Seed Multiplication Scheme. All the quantities excepting 27,680 lbs. sold on cash payment, were paid for from the advance received from the personal Ledger grant of the Director of Agriculture. The consequent crop grew very satisfactorily throughout the season and have by this time given quite a bumper harvest.

The *rabi* flooding during the year being exceptionally good it was proposed to take due advantage of it by multiplying Pusa 12 on a very grand scale in North Sind. Accordingly an advance of Rs. 10,000 was obtained from the Personal Ledger Account of the Director, Rs. 8,000 were raised from the leading zamindars of Ghotki Taluka and Rs. 5,000 were offered by the Seed Society of Ghotki. The whole amount of Rs. 23,000 was to be utilized in the purchase of Pusa 12 seed from outside Sind. Ghotki was fixed as the centre for the distribution of the entire seed. The preliminaries having been worked out, efforts were made to obtain the seed, but owing to extensive *rabi* cultivation having been undertaken all round, it was not possible to obtain the requisite quantity of seed at any of the important wheat centres in India and the distribution of wheat seed had therefore to be restricted to the quantities referred to above.

Wheat seed in Middle Sind.—Ordinarily there is very little wheat cultivation in Middle Sind on account of general scarcity of flooding there. Last year however, there being abundance of rains and floods, there was a wide scope for wheat cultivation there, and indents for about 2,000 maunds of Pusa 12 were received. The available supply, however,

being not adequate even for North Sind, the Middle Sind people had to make their own arrangements for wheat seed by purchasing it locally. In addition thereto 60 maunds of 8-A Wheat were distributed in Middle Sind as under :—

				Maunds
Taluka Hyderabad	..	..	..	20
„ Tando Allahyar	..	..	..	10
„ Matli	..	..	..	30

This variety of wheat also has given very encouraging results. The growers have been convinced that it is as good and as productive a variety, as Pusa 12, and even more productive when sown under well irrigation. In the market too it fetches as good a price as Pusa 12. The only difference between the two wheats is that Pusa 12 ripens somewhat earlier than the other varieties. It is a pleasure to remark that the Punjab 8-A wheat is now gaining steadily in popularity and appreciation.

(c) *Select varieties of rice.*—During the last kharif 41,926 lbs. of

		lbs.
Kangni	..	30,150
Sugdasi—	..	
Jajai	..	5,525
Prong	..	6,251
		41,926

the marginally noted paddy strains produced at the Larkana Seed Farm had been distributed among five progressive zamindars under the Seed Multiplication Scheme. Owing to deficiency of water supply in the beginning of the season only 618

jirebs could be sown with the above seed (534 jirebs under kangni and 84 under both varieties of the Sugdasi, viz. Jajai and Prong). Owing to heavy rains and floods some of the rice plots were adversely affected and finally 410 jirebs of Kangni and 45 jirebs of Sugdasi were selected, wherefrom seed for the next Kharif was proposed to be purchased. The area sown under the above selected seeds was inspected from time to time by the Inspector and the Overseer and rougueing too was done under the supervision of the Department. The above areas yielded 16,268 lbs. of Sugdasi, and 1,02,173 lbs. of Kangni, which became available for further multiplication. Of these 17,347 have been purchased departmentally out of the Personal Ledger grant of the Director and given out to zamindars for cultivation during the current Kharif. The remaining 1,01,094 lbs. have been distributed by Khan Bahadur Mahomed Ayoub Khan Khuhro, M.L.C., President, Larkana Taluka Development Association, to zamindars and his haris for multiplication.

In addition to this 21,675 lbs. of pure strain paddy seeds produced at the Larkana Farm have again been distributed amongst seven progressive Jamindars under the multiplication scheme.

During the current Kharif therefore 1,40,116 lbs. of paddy seeds (departmental strains) have been distributed amongst progressive zamindars, which will approximately cover an area of 1,700 acres. Khan Bahadur Khuhro one of the biggest zamindars in Larkana

District says that this year he has put the entire area of his land under selected paddy strains and that he has not used a single maund of outside variety. This shows the degree of appreciation, our departmental strains are commanding with the public.

Jowar strains.—During the year under report 3,389 lbs. of the marginally noted selected strain Jowar seeds received from the Larkana and Sakrand Farms were given out to five well advanced zamindars of Shikarpur, Ghotki and Mirpur Mathelo Talukas.

	lbs.	
Allakh ..	240	
Achro Kartuho ..	595	
Saoro ..	994	
Bagdar ..	851	
Red Janpur ..	709	

It is interesting to note that the producers were interested with the Saoro Kartuho of Sakrand Farm and stated that it germinated more satisfactorily, and earlier than the local varieties of Jowar. There is therefore comparatively a greater demand for it than other varieties.

Berseem seed.—Indents for about 2,000 lbs. of Berseem seed were received during the year and forwarded as usual to the Deputy Director of Agriculture for necessary supply. The seed was duly supplied to the Hyderabad Taluka Development Association through whose agency the distribution was effected.

The seed germinated very well and gave ample satisfaction to the growers, though owing to abundance of other verdant fodder also being available in the market, it did not fetch as high a price as it used to do previously.

Vegetable seeds.—A few ounces of snow ball cauliflower, Knol Khol, carrot, chilly and other vegetable seeds were supplied to a vegetable grower of Matli, by indenting on Messrs. Suttons and Sons of Calcutta. They gave very good results and the grower has been materially benefited by the out-turn he has realised.

II.—Popularization of Modern Implements

During the year under report the kamgars of the Associations as usual visited different villages in their respective Talukas and held demonstrations of agricultural implements in them with the Associations' pairs of bullocks. Side by side with these demonstrations they delivered lectures and distributed pamphlets regarding the utility and superiority of the implements demonstrated. These practical demonstrations held on the fields of the zamindars themselves have the much desired effect of imparting first hand information and knowledge to them and they take to the use of the implements much more readily than on mere hearsay. The number of villages visited by the North Sind kamgars was 64 and by those of Middle Sind about 100. They could have visited a much greater number of villages, but the heavy rains, floods, diseases and locust attacks suspended their activities for a good portion of the season. Moreover as the implement demonstrations have been carried on in the talukas assigned to me since the year 1923, the people have now become well conversant with our implements and the methods of cultivation suggested to them. There must, in my

opinion, now be hardly any village in the eleven Talukas where the message regarding our improved implements and methods has not reached.

However as a result of the demonstrations held in the different villages the following implements were disposed of during the year :—

	North Sind	Middle Sind	Total
Sirkar ploughs ..	88	81	169
" " with steel shares ..	48	..	48
Orient ..	5	..	5
Hand Archmedian Screws ..	14	..	14
Ridging boards ..	1	..	1
Chatnooga plough ..	..	1	1
Hindustan ..	..	1	1
Chaff cutters ..	..	7	7
Sirkar shares ..	100	10	110
Cambridge rollers worth Rs. 165 ..	..	1	1
Iron wheels ..	..	3	3
Meston ploughs ..	..	10	10

In Middle Sind the Chatnooga, Hindustan and the Sirkar ploughs have achieved much popularity among the agricultural public, the first two for their efficacy in dry ploughing, and the third for its utility in irrigated soils or second ploughing in dry and hard soils.

The Cambridge roller is also being appreciated equally for its valuable work in clod crushing. From the point of view of economy this implement commands great credit inasmuch as, it turns out very voluminous work in comparatively little time. Experience has shown that while the clods in four acre plot could, with the Cambridge roller worked by an average pair of bullocks, be broken down in six hours, the same amount of work could hardly be turned out by thirty coolies during the same time.

The steel shares to the Sirkar plough are now popular on account of their cheapness and durability. They cost about fifty per cent. less than the ordinary shares and hence their demand is increasing. A consignment of 100 such shares was therefore sent for from the Satara Industrial works and disposed of through a well known Firm at Bagirji (Taluka Sukkun).

The Sirkar plough being now very commonly used, local carpenters are manufacturing them on a large scale and disposing of them direct to the agriculturists. No record can possibly be maintained of such direct sales.

It is a matter for regret that, owing to failure of crops continuously during the last three or four years, the agriculturists have been very poor and they cannot therefore afford to go in for agricultural implements on a large scale.

III.—Popularization of Modern Methods of Farming

(a) *Dry ploughing*.—Demonstrations in dry ploughing carried on since 1923, oral lectures thereon, and broadcast distribution of leaflets and pamphlets describing in detail the advantages of the system, have gone a great way in convincing the agriculturists of its efficacy, and now there is hardly a zamindar who gives his land to the hari for cultivation but inserts invariably a clause in the agreement to the effect that the latter will immediately after the harvest give the cultivated land one or two ploughings in dry condition. The advantages of the system have been universally understood and appreciated and there is now hardly any need to popularise the system further.

In Middle Sind however the kamgars of the Associations carried on dry ploughing demonstrations in some places partly gratis and partly on hire. The area ploughed gratis was 40 acres 30 gunthas while that ploughed on rent was 50 acres yielding Rs. 148-8-0.

The dry ploughing system has added to the popularity of the Motor Tractor and two zamindars of Upper Sind have gone in for their own machines during the year, viz. (1) Khan Sahib Allah Bakhsh Khan, Zamindar, Shikarpur, and (2) Khan Bahadur M. A. Khuhro, Zamindar, Larkana. The latter proposes to give out his Tractor on rent also after completing his ploughing every year.

Wheat drilling in demonstration plots.—The following four varieties of wheat seed were received from the Botanist, Agricultural Research Station, Sakrand, for trial in Lower Sind :—

	lbs.
Pusa 12	20
C.P.H.47	20
A.T.38	20
G.S.25	20

These strains were drilled side by side in four different plots measuring 10 gunthas each. No difference was noticed when the crops were standing. Pusa 12 being an early ripener was harvested about 15 days earlier than other varieties. As regards out-turn the C.P.H.47 defeated all others. It has therefore won great appreciation with the agriculturists.

Six plots were drilled in Matli Taluka at different centres under Punjab 8-A wheat. The out-turn results were very encouraging even though the plots were drilled at a very late date. The 8-A variety of wheat as already said above has made a great impression on the agriculturists with regard to its heavy produce and greater rate in the market.

Demonstration plot of rice in Kambar.—During the year the Kambar Taluka Development Association maintained a big demonstration plot and sub-divided it into several minor experimental plots. In the first two adjacent plots rice seeds at reduced seed rate, and the usual seed rate respectively, were sown. In other two sets of plots, selected strains of Kangni and Prong varieties were sown side by side with local varieties for the sake of comparison and contrast. Owing however to heavy rains the demonstration plot was heavily flooded and suffered severely in consequence. The results therefore cannot at all compare favourably with those achieved on the same plot in previous years, which to say the least were very encouraging and satisfactory.

Miscellaneous activities

Coimbtore sugar cane No. 213 variety.—In my previous report I have dwelt at some length upon the new variety of sugar cane introduced in North Sind. The experiment carried on by Seth Gokalmal has given encouraging results as may be seen from the following figures :—

	Coimbtore No. 213	Local Lahori
Area cultivated ..	1 guntha	1 guntha
Yield in canes ..	25 maunds	20 maunds
Gul yielded ..	2½ „	2 „

The Gul prepared from the Coimbtore cane moreover was whiter in colour and fetched about eight annas higher price per maund in the market. During the current year Seth Gokalmal has increased the area under this cane to ten gunthas. Besides a fresh stock of Coimbtore sets was obtained from the Sakrand Farm and distributed gratis among the following zamindars for the purpose of experiment :—

	Maunds
(1) Seth Nanumal of Bagirji ..	5
(2) „ Dandumal of Jehan Khan ..	1½
(3) „ Jashanmal of Khahi ..	6

Trial of Artificial Manure

In April 1929 four plots of chillies, one guntha each, were secured at Ghotki from four khatedars. The plots were treated with the Union fertilizer dressing nearly three weeks after transplantation. Second dressing was given after the first picking of chillies. The plots treated with artificial manure presented better growth and matured a little earlier.

In Shikarpur Taluka 66 lbs. of sulphate of ammonia were distributed gratis to four progressive zamindars for trial as a material substitute

for growing rice seedlings. The results were not however quite so encouraging owing to deficiency of water supply in the beginning of the season.

The repeated trials of the manure have been so far successful that some zamindars have commenced to use them independently under expert advice. The two agencies locally started at Shikarpur and Larkana for the sale of these manures have sold the following quantities during the year under report for sowing rice seedlings and dressing wheat and garden crops :—

				lbs.
Shikarpur	..	..	..	980
Larkana	..	..	..	200

The Agricultural propaganda staff is rendering all possible assistance to the above firms to further encourage the sale of their manure.

In Middle Sind also, particularly in Hyderabad Taluka where the zamindars are comparatively more advanced, sulphate of ammonia is becoming more and more popular as a rab material substitute. Unfortunately however the people cannot afford to make wholesale use of it owing to shortage of funds.

Crop pests and campaign against locusts

As mentioned above, the most striking pest in Kharif was the stem-borer in jowar and bollworm in cotton. They damaged the respective crops to a considerable extent. Grass-hopper in rice crop was complained of in Larkana, Kambar and Shikarpur Talukas. The Agricultural Overseer, Larkana, and his Kamgar successfully operated a killing campaign against the pests in dehs Mahota and Gokalpur for over a week and trained several Haris there in the work.

The locust destruction work formed a most important part of the year's work. The whole staff of the Agricultural propaganda including the Supervisors and Kamgars of the Taluka Development Associations were placed fully on this work under the control of the Deputy Director of Agriculture for nearly two months. They did their best to locate the eggs and destroy them, as also the hoppers, but the results achieved were, so to say, only a drop in the ocean. The eggs in several undetected places did hatch, and the hoppers developed into swarms of locusts which did considerable damage to the crops.

Taluka Development Associations

The eleven Taluka Development Associations (one in each of the eleven Talukas of propaganda area) continued to do good work during the year and the detailed work referred to in the foregoing paragraphs has mostly been carried on through the agency of these Associations assisted by the expert advice of officers of the Agricultural Department. All the Associations, with one or two exceptions, maintain their own bullocks and depots of implements with which the kamgars carry on demonstrations from village to village. The Supervisors visited the Co-operative

societies existing in the area of the Associations' operations, inspected their records, trained secretaries and Managing Committee members and also helped them in effecting recoveries.

Conclusion

In conclusion I must thank the Agricultural staff placed under me for propaganda work for the unabated zeal and enthusiasm with which they have been co-operating with me in carrying on my work. I must especially in this connection mention the name of Mr. Jaffer Ali Ansari, Agricultural Inspector, North Sind, whose expert knowledge of agriculture and thorough experience of Sind conditions constitute a very valuable factor in making the propaganda work effective and successful.

He carried on the whole propaganda work during the period of my absence on leave very successfully and in my opinion is quite fit to hold some responsible charge independently.

· AZIM KHAN,

Deputy Registrar, Co-operative Societies in Sind.

**List of Agricultural Bulletins published by the Department
of Agriculture and kept for Sale at the Government
Book Depot, Bombay**

No.	Year	Subject	Price		
			Rs.	s.	p.
32	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa	0	8	0
33	1909	Cultivation of Broach Cotton in Dharwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D.	0	4	0
„	1909	Do. do. (Kanarese)	0	4	0
34	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona	0	4	0
36	1910	First Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist	0	14	0
37	1910	An Examination of the Seed-Supply of the Broach District, by G. D. Mehta	0	4	0
39	1910	The Salt Lands of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona	0	5	0
40	1911	The Cultivation of Guavas near Poona, Dharwar and Limbgaon	0	12	0
41	1911	Groundnuts in the Bombay Deccan	0	4	0
43	1911	An Examination of the Seed-Supply of the Broach District, Part II	0	5	0
44	1911	Preliminary Study of the Red Rot of Sugarcane in the Bombay Presidency	0	8	0
45	1911	Second Year's Experiments in the Treatment of Grape-Vine Mildew in the Bombay Presidency	0	14	0
46	1911	Seed Selection Series I, Broach Cotton	0	8	0
47	1911	San Hemp	0	4	0
48	1911	Poona Furnace	0	7	0
„	1911	Do. (Marathi)	0	6	0
49	1911	An Examination of the Seed-Supply of the Ahmednagar District, Part I	0	5	0
50	1912	An Examination of the Seed-Supply of the Ahmednagar District, Part II	0	3	0
51	1912	Third Year's Experiments in the Treatment of Grape-Vine Mildew	0	3	0
52	1912	Muscovado Sugar Machinery and its scope for Gul Manufacture in India	0	8	0
53	1912	A Method of improving the Quality of Cotton Seed	0	7	0
55	1913	An Examination of the Seed-Supply of the Poona District	0	3	0
57	1913	Improvement of the Indigenous Plough of Western India	0	12	0
59	1914	Common Salt and its use as Manure in the Konkan Division	0	3	0
62	1914	The Value of Castration of Deccan Bullocks	0	3	0
63	1914	Substitutes for Rab	0	3	0
64	1914	Alkali or Kalar Experiments and Completion Report of Daulat- pur Reclamation Station in Sind	0	14	0
65	1914	A list of diseases of Economic Plants occurring in the Bombay Presidency	0	4	0
67	1914	An Examination of the Seed-Supply of the Sholapur District	0	3	0

No.	Year	Subject	Price		
			Rs.	a.	p.
69	1915	The Rice Stem Borer in the Konkan	0	3	6
70	1915	Improvement of Cotton in the Bombay Presidency (except Sind). ..	0	3	6
74	1915	Well Waters from the Trap Area of Western India	0	6	0
78	1916	Some wild fodder plants of the Bombay Presidency	0	13	0
79	1916	The Cultivation of Guavas in Gujarat	0	5	6
80	1916	List of Seeds available on the Agricultural College Farm, Poona. ..	0	5	3
81	1916	Note on Fencing Construction	0	6	9
82	1916	Cultivation of drilled paddy in South Bombay Presidency	0	8	0
83	1917	The Spice Gardens of Sirsi in Kanara	0	10	6
84	1917	Seed Selection Series—Kumpta Cotton	0	1	0
85	1917	Note on Cattle in the Bombay Presidency	0	11	0
86	1917	Establishment and Management of the Dairy Farm	0	7	0
87	1918	The Utilisation of Inferior Grass Herbage, Experiments at the Tegur Cattle Farm	0	9	0
88	1918	First Report on Fruit Culture as practised round about Tharushah (Sind) in Nawabshah District	0	2	0
89	1918	Artificial Manures: Experiments on their value for crops in Western India	0	3	3
90	1918	Work on the Manjri Farms for the years 1915-18	0	7	3
91	1919	The Cultivation of Berseem in Sind—Experiments at Sukkur	0	1	0
92	1919	Classification and Description of the Jowars of the Bombay Karnatak	0	10	3
93	1919	Palm Gul Manufacture in the Bombay Presidency (principally Date Palm)	1	3	9
94	1919	The Sugarcane Borer and its Control	0	4	3
96	1920	Investigations into the nature of the Salt Lands of Sind	0	12	0
97	1920	Prickly-Pear as a Cattle Food	1	4	0
98	1920	Fruit Culture as practised near Shikarpur, Sind	0	1	6
99	1920	Rice Cultivation in the Larkana District, Sind	0	8	0
100	1920	Fodder Crops of Western India	2	1	0
101	1920	Fruit Culture in Palitana and Jamnagar	0	8	6
102	1920	Investigations on Potato Cultivation in Western India	1	15	0
103	1920	The Book of the Mango Do. do. (Marathi).	3	5	0
104	1920	The Ganeshkhind Botanical Garden, Kirkee (Its Genesis and Development)	0	15	6
105	1920	The Groundnut Bug and its Control	0	2	0
106	1920	Dharwar American Cotton: Its History, Cultivation and Improvement	0	7	0
107	1921	Gonag—a weed in drilled paddy	0	5	0
109	1921	The Crops of the Bombay Presidency—their Geography and statistics	2	13	0
110	1922	Year Book of the Agricultural Department in the Southern Division	0	5	0
111	1923	A Note on Well Boring	0	8	0
112	1923	Improvement of Grazing Areas in the Bombay Presidency	0	11	6
113	1923	Year Book of the Agricultural Department in Sind Division	0	8	6
114	1923	Studies on the Rice Plant and on Rice Cultivation	0	13	0
115	1924	Shevri as a Fodder Crop	0	3	0

No.	Year	Subject	Price		
			Rs.	s.	p.
116	1924	Sugar Industry in Western India and methods of Sugar Manufacture	1	2	0
117	1924	Investigations in Fig Culture and Treatment	0	5	6
118	1924	Land Crabs as Agricultural Pests in Western India	0	8	0
119	1924	Year Book of the Agricultural Department in Southern Division, 1924	0	4	6
120	1924	Silage for Fodder in Western India	0	4	0
121	1924	Further Investigation on Potato	0	6	0
72	(Revised 1925)	Experiments with the Automatic Water Finder in the Trap Region of Western India	0	4	0
122	1925	Sugarcane Varieties of Bombay Presidency, India	0	2	6
123	1925	Ridge cultivation in Lower Gujarat	0	8	0
124	1925	The Chemical Composition of Food-grain vegetables and Fruits of Western India	0	3	6
125	1925	Some of the promising exotic sugarcane varieties of the Manjri Farm	0	13	0
126	1925	The Bhagnari Breed of Cattle in Sind and Baluchistan	0	6	0
127	1926	Elephant Grass—a new and useful Fodder crop in Western India	0	1	0
128	1926	Cotton cultivation in Sind	0	3	0
129	1926	The treatment of patches of Inferior Tobacco in Northern Gujarat	0	1	6
130	1926	Some useful forest Trees and Shrubs of the Coastal Tract and their fodder value	0	8	0
131	1926	The Fig Industry of Asia Minor	0	4	6
132	1926	The Improvement of Tobacco in Northern Gujarat	0	4	0
133	1926	Work of the Ganeshkhind Botanical Gardens and Modibag Garden in 1921-25	0	2	0
134	1927	Murrah Buffaloes in Sind	0	2	6
135	1927	An improved method of growing turmeric in the Deccan	0	4	0
136	1927	Cattle Breeding in the Bombay Presidency—Principles and Progress	0	5	6
137	1927	Notes on the Lemon Industry in Italy	0	2	0
138	1927	Injurious Field Rats of Lower Sind and their extermination	0	7	6
139	1927	Sugarcane Mills and small power crushers in the Bombay Presidency	0	6	6
140	1927	Tobacco cultivation in the Southern Maratha Country	0	3	0
141	1927	Trees and shrubs for producing green manure in the Konkan and North Kanara	0	3	0
142	1927	Dry Farming methods in the Deccan	0	6	9
143	1927	Experiments on Cotton manuring in Khandesh	0	1	3
144	1927	Furnaces for making gul or erude sugar in the Bombay Presidency	0	7	3
95	(Revised 1927)	The cultivation of oranges and allied fruits in the Bombay Presidency	0	3	0
146	1927	Crops of the Bombay Presidency : their Geography and Statistics, Part II	1	11	0
147	1927	Organisation and cost of gul making in the Deccan Sugarcane tracts	0	2	6
148	1927	Culture of Guava and its improvement by selection in Western India	0	7	3
150	1927	Crops of Sind : their Geography and Statistics	2	1	0

No.	Year	Subject	Price		
			Rs.	a.	p.
151	1928	Selections in the Jowars of the Bombay Presidency ..	0	6	0
152	1928	Water-finder work in the Bombay Presidency ..	0	8	0
153	1928	Economic value of fruit farming in Western India ..	0	6	0
154	1928	Assimilation of nutrients by the rice plant (Technical series) ..	0	5	0
155	1928	Die-back disease of citrus trees and its relation to the soils of Western India	0	5	0
30	(Revised 1928)	Field, Garden and Orchard crops of the Bombay Presidency	0	7	0
156	1928	Grape culture in Western India.			
157	1929	Study of the soils associated with the deterioration of the Cardamom crop in North Kanara	0	3	0
158	1929	Preliminary note on the possibilities of the development of Lemon Industry in Western India	0	2	0
159	1929	Agriculture in Sind under the Barrage Canals system ..	0	6	0
160	1929	Soils of the Bombay Presidency.			
161	1930	Cattle feeds of Western India.			
162	1930	Papaya cultivation in the Bombay Presidency.			
163	1930	Powdery mildew of the grape and its control in Bombay. (In Press.)			
164	1930	Study in intensive farming, near Poona under Canal Irrigation. (In Press.)			
165	1930	Frost of January 1929 and its damage to crops of the Bombay Presidency. (In Press.)			